FIRST ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH

OF THE

STATE OF CONNECTICUT.

FOR THE

Fiscal Year Ending November 31, 1878.

Printed by Order of the Legislature.

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1879.

State of Connecticut,
Office of the
Secretary of the State Board of Health,
Hartford, December, 1878.

To His Excellency R. D. Hubbard, Governor of Connecticut:

Sir,—In compliance with the laws of this State, I have the honor to present to you the accompanying report for the fiscal year ending November 30, 1878.

Very respectfully,

C. W. CHAMBERLAIN,
Secretary of the State Board of Health.

AN ACT ESTABLISHING A STATE BOARD OF HEALTH.

GENERAL ASSEMBLY, JANUARY SESSION, A. D. 1878.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. That the governor, by and with the advice and consent of the senate, shall appoint six persons, three of whom shall always be physicians, and one lawyer, who, together with a secretary to be elected by them, shall constitute the State Board of Health. Of the six persons first appointed, two shall serve for two years, two for four years, and two for six years, from the first day of July next following their confirmation, and the governor shall hereafter biennially appoint, by and with the advice and consent of the senate, two members of said State Board of Health, to hold their offices for six years from the first day of July next following their confirmation. If a vacancy occur in said board during a recess of the legislature it shall be filled by the governor until the next regular session of the same.

SEC. 2. That the State Board of Health shall meet at least once in every three months, and as much oftener as they may deem proper. Four members shall always constitute a quorum for business. No member of the board shall receive any compensation except the secretary, but the actual traveling and other expenses of the members while engaged in the duties of the board shall be allowed and paid out of the appropriation made for its support. They shall select annually one member of the board as president, and shall appoint a suitable person, who shall be a physician, to be their permanent secretary and executive officer, who shall hold his office so long as he shall faithfully discharge the duties thereof, but who may be removed for cause at any meeting of the board, a majority of the members voting therefor. If a member of the board be elected as secretary the vacancy thus caused shall be filled by the governor, as provided in section first.

SEC. 3. That the secretary shall keep a record of the acts and proceedings of the board, perform and superintend the work prescribed in this act, and such other duties as the board may order under their general direction, and shall receive an annual salary of one thousand dollars, which shall be paid him in the same manner as the salaries of other State officers are paid, and such necessary expenses as the comptroller of the treasury shall audit, on the presentation of an itemized account, with vouchers annexed and the certificate of the board, shall be allowed him.

SEC. 4. That the said State Board of Health shall take cognizance of the interests of health and life among the people of this State; they shall make sanitary investigations and inquiries respecting the causes of disease, and

especially of epidemics, the sources of mortality, and the effects of localities, employments, conditions, *ingesta*, habits, and other circumstances upon the public health; and they shall collect such information in respect of these matters as may be useful in the discharge of their duties, and contribute to the promotion of health and the security of life in this State; they shall cause to be made by their secretary or by a committee of the board, inspections at such times as they may deem best, and whenever directed by the governor or the legislature, of all public hospitals, prisons, asylums, or other public institutions, in regard to the location, drainage, water supply, disposal of *excreta*, heating and ventilation, and other circumstances in any way affecting the health of their inmates, and shall also suggest such remedies as they may consider suitable for the removal of all conditions detrimental to health in the said institutions, in writing, to the officers thereof.

Sec. 5. That the said board shall cause all proper sanitary information in its possession to be promptly forwarded to the local health authorities of any city, village, town, or county in this State, which may request the same, adding thereto such useful suggestions as the experience of said board may supply. And it is also hereby made the duty of said local health authorities to supply the like information and suggestions to said State Board of Health, together with a copy of all their reports and other publications. And said board of health is authorized to require reports and information (at such times and of such facts, and generally of such nature and extent, relating to the safety of life and promotion of health, as its by-laws or rules may provide) from all public dispensaries, hospitals, asylums, infirmaries, prisons, and schools, and from the managers, principals, and officers thereof; and from all other public institutions, their officers and managers, and from the proprietors, managers, lessees, and occupants of all places of public resort in the State; but such reports and information shall only be required concerning matters or particulars in respect of which it may in its opinion need information for the proper discharge of its duties. Said board shall, when requested by public authorities, or when they deem it best, advise officers of the state, county, or local government in regard to sanitary drainage, and the location, drainage, ventilation, and sanitary provisions of any public institution, building, or public place.

Sec. 6. That it shall be the duty of the state board to give all information that may be reasonably requested, concerning any threatened danger to the public health, to the local health officers, and all other sanitary authorities in the State, who shall give the like information to said board; and said board and said officers, and said sanitary authorities shall, so far as legal and practicable, co-operate together to prevent the spread of disease, and for the protection of life and the promotion of health, within the sphere of their respective duties.

Sec. 7. That said board may, from time to time, engage suitable persons to render sanitary service and to make or supervise practical and scientific investigations and examinations requiring expert skill, and to prepare plans and reports relative thereto. And it is hereby made the duty of all boards and agents, having the control, charge, or custody of

any public structure, work, ground, or erection, or any plan, description, outlines, drawings, or charts thereof, or relating thereto, made, kept, or controlled under any public authority, to permit and facilitate the examination and inspection, and the making of copies of the same by any officer or person by said board authorized; and the members of said board, and such other officer or person as may at any time be by said board authorized, may, without fee or hindrance, enter, examine, and survey all such grounds, erections, vehicles, structures, apartments, buildings, and places.

Sec. 8. That it shall be the duty of the State Board of Health to have the general supervision of the State system of registration of births, marriages, and deaths. Said board shall prepare the necessary methods and forms for obtaining and preserving such records, and to insure the faithful registration of the same in the several counties, and in the central bureau of vital statistics at the capital of the State. The said board of health shall recommend such forms and amendments of law as shall be deemed to be necessary for the thorough organization and efficiency of the registration of vital statistics throughout the State. The secretary of said board of health shall be the superintendent of registration of vital statistics. As supervised by the said board, the clerical duties and safe keeping of the bureau of vital statistics thus created shall be provided for by the Comptroller of the State, who shall also provide and furnish such apartments and stationery as said board shall require in the discharge of its duties.

Sec. 9. That the said board, on or before the first day of December in each year, shall make a report in writing to the governor, upon the vital statistics and the sanitary condition and prospects of the State, which report shall also set forth the action of said board, and its officers and agents, and the names thereof for the past year, and shall contain a full statement of their acts, investigations, and discoveries, with such suggestions for further legislative action or other precautions as they may deem proper for the better protection of life and health. This report shall also contain a detailed statement of the moneys expended by said board, and the manner of their expenditure the year for which it is made; but the total amount paid for the expenses of this board, including the salary and expenses of the secretary, shall not exceed three thousand dollars, which amount is hereby annually appropriated for this purpose, to be paid by the treasurer, on the comptroller's warrant, in such sums as the certificate of the board, with proper vouchers annexed, may certify from time to time.

Sec. 10. That this act shall take effect from the date of its passage; and that all acts or parts of acts inconsistent herewith, be, and the same are hereby, repealed.

GENERAL REPORT.

The requirement of a report in December renders this first report necessarily incomplete, as the returns from the registrars of vital statistics are not made until the last of January of the ensuing year, and the report on vital statistics cannot be made until our second annual report, from the nature of the subject. This report therefore covers but the brief period of five months, and notwithstanding the little time we have had in which to work, it is hoped that this first report even may be of interest and value to the people of the State, in whose behalf we labor. The following statement explains our plans and methods thus far:

The work entered upon during the first few months, must, in the nature of things, be, to a great extent, of a preliminary or preparatory character. Before entertaining any very comprehensive plans, a survey of the field, and exact knowledge of the sanitary condition and requirements of the State was needed, to secure a solid basis of fact, preparatory to action. The work of organizing the board and bringing it into communication with the people, was obviously among the first to be undertaken. To awaken intelligent interest in sanitary science, and demonstrate its practical utility not only in preventing disease and prolonging the average duration of life, but also in securing healthy and efficient lives would excuse the devotion of a much greater period of time to the sole endeavor to develop a public sentiment that shall regard a neglect of plain sanitary principles as criminally careless.

In the systematic effort to bring clearly before the people of this State the value of sanitary science, and to show what it has accomplished, and can accomplish for families, communities, and states, the following plan has been followed for the most part: 1st, To assign to each member of the Board some special field for work and investigation, the results as they take shape to be printed in our reports. 2d, By publications, short and concise, explaining in general terms the nature and scope of public hygiene, and our

objects and aims. The following circular was sent to every clergyman in the State, as "the same causes which produce physical disease, foster also immorality, degradation, and social misery. Uninhabitable habitations, foul air, neglect of personal and public cleanliness, insufficient sanitary appliances, are not only factors of disease but of moral degradation."

The appeal to the clergy was rendered appropriate, too, from their position as public instructors, since they as a class are among the most public-spirited of our citizens, and from the nature of their work come into close relations with all classes of society.

CONNECTICUT STATE BOARD OF HEALTH.

To the Clergy of the State of Connecticut:

Rev. Sirs,—As you are probably aware, the Legislature at its last session passed the act creating a State Board of Health. We desire the co-operation of all interested in the welfare of humanity in our work. As unsanitary conditions have a close and perhaps causative relation to want and misery, and foster the development of vice and crime, we make a special appeal to you for aid.

Great advances have been made of late in ascertaining the causes and prevention of disease, and controlling the contagious and infectious diseases which form an unnecessarily large element in the production of sickness and death in our own State. The knowledge of the means of preventing and controlling these evils to a very great extent has already been gained, and it is only necessary to diffuse it among the people and act upon it to reap the results in the improvement of public health, the promotion of public happiness, and the prolonging of human life. To carry out these measures extensively, requires some public agency and the support of all classes of the community. The work of the Board in some of its principal features might be thus outlined:

To instruct the people as to the causes and prevention of disease; to study the local influences affecting health,—race, population, soil, water supply, drainage, food, labor, climate, productions, social conditions, etc.,—to obtain accurate and reliable statistics relating to birth, marriage, and death rates, and their relations to race, sex, age, etc.; to watch the appearance of infectious and contagious diseases and study them as influenced by local conditions, and to take measures to control them; to study unsanitary conditions as they exist amongst us, and to recommend measures for relief; to organize and systematize the work throughout the State, by encouraging the formation of local health boards.

We desire correspondents in each town and village concerning our work, and would solicit from you, in addition to what aid you can give us in this direction, the names of those, one or more, in your localities who would act as regular correspondents and properly represent the district. All blanks, etc., for correspondence will be furnished on application to the Secretary.

The responses received to this were most encouraging, and the generous promises of aid fully realized when called for.

The circular on public hygiene is designed for more general distribution, and special editions, varied somewhat, have been sent to every physician in the State, to members of the learned professions, men in public stations and the like, and to any desirous of comprehending the general nature of sanitary work. Two thousand copies of this have been circulated.

PUBLIC HYGIENE.

"The aim of public hygiene is to arrest or prevent, by official measures, all diseases which are not, in their nature, strictly limited to the individual, but which, from external causes, or from their specific characters, have a tendency to spread throughout families, institutions, and communities, and which cannot be otherwise controlled."

Sanitary science has proved that many of the diseases which act as the principal factors in producing death, are preventable and controllable by practical hygienic measures from the neglect of which not only are many precious lives wasted every year, but many also crippled and dwarfed by disease; lucrative enterprises abandoned; hopes blasted, and poverty and want induced, if not pauperism, vice, and crime, from the distress caused by the losses resulting from unnecessary sickness and death.

It costs to be sick, and more to die; and if we simply estimate the cash value of the lives wasted each year, during the productive period of life in this State, the sum would be expressed in many millions of dollars. This estimate rests upon the same basis used by the great business men of the world, the statesman and scientist, and is as reliable also in sanitary science.

Although the general principles concerning the prevention of disease have been long known and published, still the knowledge has been confined to a few, and consequently their application has been limited, and it is not until the elements of sanitary science are known and appreciated by every citizen that the desired results can be fully attained in the prevention of disease and death, the preservation of health, the prolonging of human life, and the promotion of public wealth and prosperity.

Says Disraeli, "The health of the people is really the foundation upon which all their happiness and all their power as a state depend. The health of the people is, in my opinion, therefore, the first duty of the statesman; and I am confident that there is no object of higher importance to engage the interests of society."

Great advances have been made during the last few years in sanitary science, in relation to the causes of disease and the control of epidemic, infectious, and contagious diseases. To systematically disseminate this knowledge among the people, and carry out the necessary measures extensively and throughout the State requires some public agency, and this work the State Board of Health propose to inaugurate and carry out.

The prosperity of any community, and its comparative healthfulness, are inseparably connected, and unsalubrious conditions effectually check development and growth. It is a part of our work to investigate the local conditions affecting health and longevity in the State; and here the value of registration of vital statistics becomes apparent, showing that diseases appear irregularly and with certain conditions, increasing or decreasing as these conditions vary.

Besides the great value in the work of the Board of the complete return of vital statistics we hope to secure, the legal and historic value of complete statistics is unquestionable in relation to Probate Courts, and in securing titles, in deciding questions of legitimacy, settlement, and descent, in their relations to life insurance, annuities, endowments, and in establishing the claims upon government for pensions. Unless their attention has been especially directed to the subject, but few are aware of the interests involved in a complete return of vital statistics in any community in relation to the art of healthy living, and in promoting the best interests of society.

The value of family training, of the heritage of unvitiated constitutions, the penalties of vicious living exacted from succeeding generations, and in fact all the varied agencies that war against health and life can only be fully appreciated by reviewing the life-history of many successive generations from the cradle to the grave. The welfare of the living, duty to the dead that their loved ones should not be inconvenienced or defrauded by negligence to secure the protection thus offered, and the ends of public justice, public order, and public morality in securing every safeguard that the law throws around the sanctity of marriage, the legitimacy of birth, and the burial of the dead, as well as the aid thus afforded to the prevention of crime, alike demand that these records shall be *complete, prompt,* and *faithful.*

The work of the State Board of Health, thus briefly sketched in some of its aspects, affecting as it does the interests of the public at large, and having for its central aim and purpose the promotion of public prosperity, and a "race of healthy, vigorous, long-lived, moral human beings which sanitary administration tends to produce," can depend upon no one profession or class for support, but must enlist the sympathies and co-operation of all in dealing with interests so complex and varied. The value and power of sanitary administration has been so thoroughly tested that we appeal with the utmost confidence for that assistance and co-operation we need in forming local organizations throughout the State, and rendering of practical benefit the knowledge and powers now available in the prevention of disease and death.

In no other way can the cause of rational scientific medicine be so well advanced or medical superstitions of every form dissipated, as by teaching the people the true nature of disease, its causes and prevention. Nor can we as physicians better secure for our profession its true place and influence in the State than by working in the field opened to us by the creation of this Board. We therefore appeal especially and confidently to the physicians of the State for their aid; we desire special correspondents in

every town who will report upon the public health and local sanitary affairs. All blanks necessary for correspondence will be furnished by the Secretary. Especial attention is called to the digest of registration laws, and regular monthly returns to the registrars earnestly solicited. The value of vital statistics depends upon their comparative completeness and exactness, and this can only be secured by regularity and promptness in the individual returns.

By order of the Board,

C. W. CHAMBERLAIN, M.D.,
Secretary State Board of Health.

3d. By the publication of plain and simple statements concerning the nature of some special form of disease, the manner in which it spreads, its causes, and practicable directions for prevention and control. As diphtheria has been very prevalent in this State, and is likely to become endemic unless systematically resisted, it was selected as the first of a series of health manuals which will be extended to embrace such subjects as are most closely related to healthy living, and in relation to which ignorance and negligence are most harmful. This is intended for general distribution to all school boards, health authorities, clergymen, physicians, and to the people generally, and to be kept on hand for use whenever called for.

RESTRICTION AND PREVENTION OF DIPHTHERIA.

GENERAL RULES AGAINST INFECTION.

Pure air, pure water, proper food and clothing, are essential conditions of health. *Cleanliness, dryness,* and *ventilation,* in and around dwellings and places of public resort, are the surest safeguard.

No house refuse, filth, excremental matter, or foul dirt should be allowed to remain about inhabited dwellings.

Filthy, foul, and *damp* places, saturated with sink or slop water, and shaded by vegetation or otherwise, near dwellings or places of public resort, should be purified, cleansed, and dried, and as free access of air and sunlight provided as possible. They foster, nourish, and render more fatal, if they do not produce pestilential diseases.

Disinfection should be thoroughly and persistently used at the appearance of a contagious disease. Disinfectants destroy contagion that would otherwise spread and multiply.

All sewer connections should be trapped and *ventilated.*

Nurses and attendants should spend some time each day in *pure air,* and take out-of-door exercise whenever possible, but at such times as to avoid contact with others.

DIPHTHERIA

Is an infectious and contagious disease, though not as contagious as scarlet fever or small-pox, still requiring great precaution. Children are more liable than adults, and may convey it to one another, or it may be conveyed to them by adults.

The infection clings to articles in the room where cases have occurred, causing a reappearance of the disease, and after a single case it often breaks out in many places, always within a restricted area, sometimes gathering strength in its passage. Hence the importance of thorough disinfection. Unsanitary conditions favor its spread and increase its malignancy.

It is contagious by the exhalations from the sick, contaminating the air of the sick-room *in proportion to the severity of the case,* and the extent of the membrane in the throat; by direct contact with infected articles, *e. g.* by the use of eating or drinking utensils, towels, handkerchiefs, etc., used about the sick. It is conveyed by the diphtheritic membrane coming into contact with any mucous surface (*e. g.* mouth or nose), through kissing, sneezing, or coughing. The poison usually enters the system through the throat and upper air-passage.

RULES FOR PREVENTION.

First. ISOLATE THE SICK in a well-ventilated room, preferably the uppermost room in the house. Place the bed so as to be accessible on all sides. Allow no person to enter except the necessary attendants. *In malignant cases* allow no one to go from the house to school, or to any public assembly.

Second. In preparing the sick-room remove all unnecessary articles of furniture. Carpets, curtains, and table covers are especially liable to retain infection. After use the room should be cleansed and ventilated, and in malignant cases, disinfected thoroughly.

Third. All bed and body clothing, towels and handkerchiefs used by the sick, as soon as removed, should be placed in vessels containing disinfecting fluids, and never be washed with other household articles. All plates, cups, glasses, spoons, and the like, used by the sick, should be rinsed with some disinfectant and washed separately.

Fourth. Nurses and attendants should wear only washable garments, and use disinfected water, for hands, unsparingly. Physicians and clergymen should be provided with disinfected water for their hands on leaving the sick room.

Fifth. All scraps of linen used in receiving discharges from the mouth or nose should be immediately burned. All receptacles for filth should be thoroughly disinfected.

Sixth. CHILDREN should not be allowed to attend the funerals of those dying from diphtheria. Disinfectants should be used freely in the room and about the body while it remains unburied. The coffin should never be opened at funerals to expose the dead to the public.

DISINFECTANTS.

The following disinfectants are recommended by the Board:

FOR DISINFECTING PRIVIES, ASH-PITS, CESSPOOLS, DRAINS, AND OTHER OFFENSIVE PLACES.

Fifty pounds of copperas (sulphate of iron, green vitriol) to a barrel of water.

This may be dissolved in a smaller quantity of water, and then diluted. It may be used freely and repeated as often as odors arise. It is cheap and efficient. About four gallons are required to disinfect an ordinary vault used by one family. A smaller quantity may then be poured in occasionally.

FOR SINK-PIPES AND WATER-CLOSETS.

One pound of nitrate of lead to a gallon of water. Use freely.

FOR ARTICLES OF CLOTHING, ETC., USED ABOUT THE PATIENT.

Sulphate of zinc, eight ounces, crude carbolic acid, one ounce, warm water, four gallons.

Throw all articles of body linen, sheets, etc., at once into this solution and boil in clear water. In malignant cases such articles should be boiled in this solution, diluted with an equal quantity of water, previous to boiling in soap and water. It can be used freely in the sick-room. It does not stain. A towel may be wet with it and hung in the room. A sheet may be hung across the entrance hall or door and kept constantly wet with it. Nurses and attendants will find it well to occasionally wash their hands in this fluid.

Bromo-chloralum, diluted with eight or ten parts of water, can be used in the sick-room for wetting towels and sheets, as above described, and for washing the hands, when the odor of carbolic acid is offensive, as it is odorless.

4th. By securing correspondents in every town in the State, who are intelligently interested in sanitary subjects, or willing to become so, and who will act as a medium of communication between us and the people, as sanitary reporters concerning prevalent diseases and all local conditions relating to health, and aid in securing a sanitary history of each place, to be kept continuous hereafter by the aid of such reports and the mortality returns. Correspondents have already been secured in most of the towns of the State. Blanks 1 and 2, for country and village, commence the sanitary history, and the following postal card blank serves for regular correspondence concerning prevalent diseases. This system of correspondence is of course a permanent and important part of the organization of the Board, and inseparably connected with its successful working:

Estimated Population,

REPORT FOR

for the *ending* *187*

DISEASES.	Prevalence and Severity.	No. of Deaths.
1 Small-Pox, - - - - - -		
2 Scarlet Fever or Scarlatina, - - - -		
3 Diphtheria, - - - - - -		
4 Typhoid Fever, - - - - -		
5 Intermittent Fever, - - - - -		
6 Typho-Malarial Fever, - - - -		
7 Cholera Infantum, - - - - -		
8 Cerebro-spinal Meningitis, - - - -		
9 Croup, - - - - - - -		
10 Whooping Cough, - - - - -		
11 Dysentery, - - - - - -		
12 Diarrhœal Diseases, - - - - -		
13 Consumption, - - - - - -		
14 Acute Lung Diseases, - - - - -		
Total number of Deaths, - - - -		

[Please note UNUSUAL causes not specified and the PREVALENCE OF ANY DISEASE, as far as you know of them. Give approximate number of cases. Indicate severity by † if more than usual; by — if less.]

REMARKS.

Signature.

STATE BOARD OF HEALTH.

BLANK No. 1.

Town of *187*

Reporter.

1. Estimated population.
2. Estimated number of acres.
3. Principal occupations of inhabitants.
4. Trades or manufactures carried on.
5. Principal crops raised.
6. Principal fruits cultivated.
7. Average acreage of woodland.
8. Principal kinds of timber.
9. Nature of soil.*

* Clay, sandy, gravelly, etc.

10. Favorable or not for natural drainage.
11. Estimate acres of low, wet, undrained land.
    Swamps and marshes.
12. Estimate number of acres drained during last five years.
13. Disturbance of natural drainage by reservoirs, dams, embankments, or excavations.
14. Note any disturbance of health following.
15. Streams, ponds, and other bodies of water.
16. Bodies of stagnant water.
17. Beds of what streams or ponds are dry, wholly or partially, and during what periods?
18. What are the ordinary diseases?*
19. Sources of drinking water.
20. Quality of water (whether hard or soft, and other qualities).
21. Average depth of wells. Shallowest. Deepest. No. of artesian.
22. Average distance of privies from wells. Least.
23. Average distance of outlet of sink-drain from well. Least.
24. Average distance of outlet of sink-drain from house.
25. Condition of privies connected with school-houses.
26. Number of paupers, and how cared for.
27. Mention what, in your opinion, are the principal sources of danger to life and health, and any unsanitary conditions that exist and are likely to produce disease.
28. Mention any unusual cases or forms of sickness.
29. How completely are the registration laws concerning births, marriages, and deaths, observed?
30. What proportion of births occur without the attendance of a physician, and how can the registration of these be secured?

STATE BOARD OF HEALTH.

BLANK No. 2.

Town of *187*

Reporter.

1. Estimated population.
2. Nationalities represented: estimated proportion.
   Estimate number living in tenement houses.*
   " " " boarding houses.
3. Trades or manufactures.
4. Health of employees: mention any liabilities to disease incurred.
5. Number families in a tenement house: average. Greatest. Least.
   Number of employees living in cottages.
6. Estimated number employees in each branch.
7. Nature of soil.†
8. What provisons for drainage, carrying off surface water?

* In order of prevalence.
† A house occupied by three families is considered a tenement house.
‡ Clay, sandy, gravelly, etc.

9. Natural drainage: streams, rivers, &c.
10. Ponds and bodies of stagnant water.
11. Beds of streams, ponds, &c., dry or partially, and during what periods ?
12. Area drained by sewers.
    Number of miles of sewers.
13. Sewers empty into what ?

If no sewers, give relations of privies and sink drains to wells, as to distance and natural drainage.

14. Sources of drinking water.
15. Quality of water (whether hard or soft, and other qualities).
16. Average depth of wells.
    No. of Artesian.
17. Number of cisterns used for drinking water.
    Number provided with filters.
18. House refuse and filth: how disposed of ?
19. Is there any local health organization?
20. If so, is it active and efficient?
21. Condition of privies, water closets, etc., connected with school-houses.
22. Number of paupers, and manner of support.
23. Public institutions for charity or correction.
24. Mention principal diseases prevalent.
25. Principal sources of danger to life and health.
26. How completely are the registration laws observed?
27. What improvements are most needed?
28. Sources of artificial illumination.

5th. By means of lectures on sanitary subjects adapted to the requirements of each locality. This work, commenced but lately, will be followed more extensively during the present winter.

6th. By monthly reports of the sanitary condition of the State, and the prevalent diseases, with such suggestions as these warrant and illustrate. The *mortality* reports are at present confined to Hartford and New Haven, and it was not until September, after persistent effort, that such report could be secured from Hartford, so imperfectly are the registration laws observed. It is hoped that more extensive reports can be secured next year.

This preliminary statement explains the general work determined upon by the board for the first half year. The specialized work will be found under the proceedings and special reports.

PROCEEDINGS

of the Connecticut State Board of Health and Bureau of Vital Statistics for the five months ending November 30th, 1878.

The following gentlemen were appointed by His Excellency Governor Hubbard, and approved by the Senate in accordance with the act of March 27, 1878:

Dr. J. S. Butler, Hartford, two years.

A. C. Lippitt, New London, two years.

A. E. Burr, Hartford, four years.

Dr. R. Hubbard, Bridgeport, four years.

Dr. C. A. Lindsley, New Haven, six years.

Prof. W. H. Brewer, New Haven, six years.

A preliminary session for completing the organization of the Board was held April 9th, at the U. S. Hotel, Hartford.

Dr. Lindsley was chosen secretary of the meeting, Dr. J. S. Butler of Hartford, was elected president for 1878–9, and Dr. C. W. Chamberlain of Hartford, permanent secretary.

Dr. Butler addressed the Board substantially as follows:

Gentlemen,—There is such a remarkable ignorance even among the more intelligent classes of the community in regard to the general laws of hygiene, that it becomes the first duty of the State Board of Health to take measures to enlighten the public mind, not only upon some of the main principles, but upon not a few of the details of public hygiene, or "State Preventive Medicine." This can be best effected,

1st. By lectures from members of the Board and others on general and special topics.

2d. By meetings for discussion of these topics, in various parts of the State.

3d. By delegations to the meetings of the various county medical societies.

4th. By distribution to every physician in the State, of reports and papers on sanitary subjects—such, for instance, as Dr. Daggett's and Dr. Lindsley's, in the Report of the New Haven Board of Health.

And, above all other means, by inducing every newspaper in the State to insert brief, compact, and frequent articles, showing what State preventive medicine is, its aims, duties, and necessities, in its various departments, and to see to it that such articles are duly prepared. We have ever found the press ready to give the aid of its great power to such humane objects.

By these and other means the Board must seek so to instruct and interest the public mind generally, and especially the medical profession, as among other results, to insure the establishment of an efficient Board of Health in every city and town in the State.

It is suggested that some of the most important topics be assigned to different members of this Board, to be reported upon at some future meeting, in such brief form as to admit, when printed, of cheap and general distribution, and to insure as far as possible the perusal of such reports by all, even the busiest man and woman in the State.

A general discussion of the topics suggested in the address followed, and of the methods best adapted to render this organization of practical utility to the people. With reference to that point in the address, on motion of Prof. Brewer the secretary was directed to address direct communications to the various medical organizations in the State, inviting their coöperation.

On motion of Mr. Burr, the secretary was directed to correspond with other State Boards of Health, and authorized to visit, personally, any societies or neighboring State Boards, if the interests and working of this Board would be directly promoted thereby.

On motion of Dr. Lindsley the secretary was directed to prepare a circular letter to registrars, advising them of the changes in the law, with such instructions as were necessary, and to report at the next meeting.

The following standing committees were then appointed:

On State Medicine and Public Hygiene—Dr. J. S. Butler.

Sanitary Legislation—A. C. Lippitt.

Protection of Buildings from the Gases of Decay—Prof. W. H. Brewer.

Vital Statistics—Prof. C. A. Lindsley, Dr. C. W. Chamberlain, *ex officio.*

Pollution of Rivers and Water Supply—Prof. W. H. Brewer.

Epidemic, Endemic, and Contagious Diseases—Dr. R. Hubbard, Dr. C. W. Chamberlain, Prof. C. A. Lindsley.

On By-Laws and Regulations—Dr. J. S. Butler, Dr. C. W. Chamberlain.

A preliminary session was held June 20th, at 2.30 P. M. Present, Drs. Butler, Lindsley, Prof. Brewer, A. E. Burr, A. C. Lippitt, and Dr. C. W. Chamberlain. The minutes of the preceding session were read and approved.

The secretary reported a plan for a postal-card system of correspondence, prepared to serve both as a return of the mortality

and of prevalent diseases. The irregularity with which returns were made to the registrars rendered both systems necessary.

The following draft of a letter sent to the various medical societies was presented:

Gentlemen of the   Medical Society:

As known to most of you, the Legislature, at the last session, passed the Act creating a State Board of Health and Bureau of Vital Satistics, thus adding this State to the number recognizing the value of the aid rational medicine can give in securing true prosperity to the State. The majority of the States of the Union now possess such organizations, and the number is yearly increasing. The success of this Board must at the outset depend largely upon the hearty coöperation of the physicians, not only individually but in their associated action and in their relations to society. We earnestly commend the subject to your consideration and discussion, and would suggest that you appoint a Committee on Public Hygiene to act more directly as our auxiliaries. We ask also your individual assistance as correspondents, and in securing prompt and regular returns of vital statistics. We also take this opportunity of soliciting careful attention and prompt replies to such circulars of inquiry as may be sent from the Board from time to time.

By order of the Board,

C. W. CHAMBERLAIN, M. D.,
Secretary.

The following circular was sent to registrars throught the State:

[Circular No. 1.]

STATE OF CONNECTICUT.

HARTFORD, CONN., June, 1878.

To the Registrars of the State of Connecticut:

Gentlemen,—As you are probably aware, the superintendence of the system of Registration of Vital Statistics passes into the hands of the State Board of Health July 1, 1878. All applications for blanks after that date, and for record books, forms for abstracts, etc., should be addressed to the Secretary State Board of Health. We desire your hearty coöperation in our endeavors to secure a better execution of the registration laws and a complete return of the vital statistics of the State. The especial points we ask your immediate attention to are these, and we will do all in our power to assist in their accomplishment:

1. To secure prompt returns, every month, of births, marriages, and deaths, as the law directs.

2. To diminish the number of deaths reported as from "cause not stated" or "ill-defined" which forms too large a proportion of our returns. If the cause of death be not stated, the reason why it is not stated should be given, and no incomplete certificates should be accepted when possible to secure the facts required by law.

We desire regular correspondents among the registrars concerning not only vital statistics, but all matters relating to public hygiene. All stationery, blanks, etc., for this purpose, will be furnished by the Board. Any person, interested in sanitary matters, who can thus aid us, are requested to send names to the secretary, and any suggestions concerning their localities that may be of use to the Board.

C. W. CHAMBERLAIN, M.D.,
Secretary State Board of Health.

A quarterly meeting of the State Board of Health was held July 6, 1878, at 2.30 P. M. Present, Drs. Butler, Lindsley, Hubbard, and Chamberlain, and Prof. W. H. Brewer.

On motion of Dr. Hubbard, the proceedings of the preliminary sessions were ratified.

Dr. C. W. Chamberlain was elected treasurer, and Dr. J. S. Butler, Prof. W. H. Brewer, and the treasurer were elected as financial committee.

The following By-Laws were reported, and adopted unanimously:

BY-LAWS AND REGULATIONS.

No paper shall be published in the annual reports unless ordered by a majority vote. All papers shall be published over the author's signature, who shall be considered as responsible for all statements of facts and opinions therein contained.

No bills shall be paid unless endorsed by two members of the financial committee.

The Secretary shall prepare and submit to the board from time to time such general and special circulars as he may deem expedient.

Any member or committee appointed for any special purpose by the board shall have free use of all blanks, forms, etc., requisite for use in securing such object, and the Secretary may extend such courtesy to any one not a member of the board who will give the right of the publication of his researches to this board, provided that such researches be directly connected with the work of this board in some of its departments.

The election of those officers which are chosen annually shall be held in January.

The following shall be the regular order of business in the stated meetings of the board:

ORDER OF BUSINESS.

1. Reading Minutes of Last Meeting.
2. Reading Communications.
3. Report of Secretary.
4. Reports of Committees.
5. Business left over.
6. New and Miscellaneous Business.

Dr. Hubbard presented a plan for studying the diseases prevalent in any place, with reference to area of sewerage, altitude, drainage, soil, etc. It was voted that Dr. Hubbard prepare a report for the city of Bridgeport upon such a basis.

Upon motion of Professor Brewer, the secretary was directed to prepare a digest of the requirements of the registration laws for general circulation.

The pamphlet on diphtheria was submitted by the secretary, and after discussion and amendment, ordered printed for general distribution.

The committee on vital statistics presented a form of death certificate, which, after discussion and amendment, was adopted as follows:

STATE OF CONNECTICUT.

CERTIFICATE OF DEATH.

To be returned to the Registrar of the Town in which the Death occurred within the first week of the month after death.

I certify, from the best information which I can obtain, that

1. Name, in full.

[Maiden name, if a married woman or widow.]

2. Place of Death, Town, No. Street.

[If a tenement house, by how many families inhabited.]

3. Date of death.
4. Age, Years, Months, Days.
5. Sex, Color, or Race.*
6. Single, married, or widowed.†
7. Birthplace, Town, State or Country.
8. Residence at time of death, Town, State or Country.
9. Occupation.
10. Name of Father.
11. Name of Mother.
12. Birthplace of Father, Town, State or Country.
13. Birthplace of Mother, " " "
14. Duration of Disease.
15. Disease or cause of Death, First or Primary, Secondary (if any.)

Signature and address of attending Physician or other person making the return.

Dated at this day of 187

[Be very particular to fill all blanks.]

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*If other than white.—(A.) African; (M.) Mulatto; (I.) Indian. If other races, specify what.

†If a Married Female or Widow, state of whom she was the Wife or Widow.

The attention of physicians is earnestly invited to the following list of diseases, in reference to which the particulars specified are essential to the *proper classification* of causes of death, and consequently to the *accuracy* and *usefulness* of our statistics of mortality. It is respectfully suggested that a *negative* statement is often as important as positive one—for instance. "Abortion—at two months—Metritis—no cause discoverable." "Cancer of Stomach—not hereditary, as far as known." "Erysipelas of Head—not of traumatic origin." "Gangrene of Leg—no definite cause." "Metritis—not puerperal." "Small-pox—patient never vaccinated." "Ovarian Tumor—no operation, etc." By secondary is meant the immediate cause of death,—e. g., hemorrhage,—in consumption; phthisis would be the primary hemoptysis the secondary cause of death,—meningitis or congestion of the brain the secondary, cholera infantum the primary, etc.

Abcesses—Location and cause, if any.

† Aneurism—Vessel involved, and mode of death. Whether operation.

* Abortion and Miscarriage—Cause, mode of death, and period of gestation.

Cerebro-Spinal-Meningitis—Variety, whether probably Zymotic (Cerebro-Spinal Fever), or a simple inflammation.

Childbirth—Circumstance producing death.

Cancer—Variety and seat; whether hereditary or not.

† Calculus—Mode of death; whether after operation, and if so, what one.

Carbuncle—Location.

Congestive Fever—Variety.

Continued Fever—Whether simple continued fever or other variety.

Dentition—Mode of death.

Disease of Heart—Variety. Valves involved, if any.

Dropsy—Variety and cause.

Enteritis and Gastro-Enteritis—Cause if known; whether Diarrhœal or not.

* Erysipelas—Seat and cause; if Traumatic, how produced.

* Fractures—Cause and mode of death. (State nature of accident, etc., clearly.)

* Gangrene—Seat and cause.

Gastric Fever—Whether Remittent, Typhoid, etc., or simple Gastritis.

Gastritis—Whether simple or from a definite cause.

† Hernia—Variety and mode of death; whether any operation.

Insanity—Variety and mode of death.

Intermittent Fever—Variety, as Quotidian, Tertian, etc.

Jaundice—Cause.

Malarial Fever—Variety.

Malignant Pustule—Location and cause; whether probably dependent on contagion or not.

Malformation (Congenital)—Variety.

Metritis—Variety and cause; (whether Puerperal or not.)

Necrosis and Caries—Seat, original cause, and mode of death.

†Ovarian Tumor—Mode of death; whether operation.

Paralysis—Variety and cause.

*Peritonitis—Variety; whether simple, puerperal, traumatic, etc., and if the last, how produced.

Phlebitis—Cause; seat and variety.

*Pyæmia—Cause; nature of antecedent injury, if any, and how produced.

*Premature Birth—Probable cause; fœtal age.

Preternatural or Abnormal Birth—Manner of.

Small-pox—How often, and when patient Vaccinated.

Syphilis—Variety, chief location, and mode of death.

*Tetanus—Whether idiopathic or traumatic. Nature of antecedent injury, if any, and how produced.

†Tumor—Location, variety and mode of death; whether operation.

Ulcers—Nature; chief location and mode of death.

Uræmia—Cause or associate affection. Whether puerperal.

*Wounds—Cause, variety, seat, and mode of death.

*Particularize any *Accident or other violent cause* leading to death, and *character or injury.*

†Specify every *Surgical Operation* with fatal results, and state the disease which necessitated it.

Mention intemperance whenever recognized as having produced or complicated the direct cause of death. Give as many particulars as possible instances of rare diseases, such as hydrophobia, glanders, etc.

REGISTRATION OF BIRTHS, MARRIAGES, AND DEATHS.

Digest of Laws.

It shall be the duty of the State Board of Health to have the general supervision of the State system of registration of births, marriages, and deaths. Said Board shall prepare the necessary methods and forms for obtaining and preserving such records. The Secretary of said Board of Health shall be the Superintendent of Registration of Vital Statistics. [See Public Acts, 1878.]

BIRTHS.

Every physician or midwife shall, before or during the first week of the month next succeeding such birth, furnish the registrar of the town wherein such birth may have taken place, a certificate properly filled out and signed by such physician or midwife.

DEATHS.

The physician who shall attend any deceased person, shall, before or during the first week of the month next succeeding such decease, leave with the registrar a certificate of death properly filled and signed.

Every sexton or other person having charge of a cemetery or other place of burial, shall, during the first week of every month, return to the registrar a list of all the interments, disinterments, or removals made by him during the month next preceding, with the dates thereof.

MARRIAGES.

Every person who shall join any persons in marriage, shall return a certificate to the registrar, properly made out and signed, before or during the first week of the month next succeeding such marriage.

PENALTIES FOR VIOLATION.

Every person who shall violate any of the provisions relating to the registration of births, marriages, and deaths, shall pay for every offense a fine of ten dollars to the use of the town wherein such offense is committed.

TOWN BY-LAWS.

Any town or city may enact by-laws not contrary to law more effectually to obtain a perfect registration of births, marriages, and deaths, and the registrar of the town in which such by-laws may be enacted shall execute these provisions under the same oath and penalty as if they were the statute laws of the State.*

The following instructions have been sent to the registrars by the State Board of Health:

1. To secure prompt returns, every month, of births, marriages, and deaths, as the law directs.

2. To diminish the number of deaths reported as from "cause not stated" or "ill-defined," which form too large a proportion of our returns. If the cause of death be not stated, the reason why it is not stated should be given, and no certificates incomplete in any essential point shall be accepted when possible to secure the facts required by law.

The attention of all concerned in the performance of these duties is urgently requested, and it would seem that the plain statement of the requirements of the law, and the recognized importance in all civilized communities of its prompt and regular observance, would secure its fulfillment, as is indeed generally the case in this State.

The registrars are hereby instructed to institute proceedings against all those who *wilfully neglect or who refuse* to observe the plain requirements of the law. As will be seen, it is the sworn duty of the registrars to execute these laws, and all good and law-abiding citizens are called upon to throw as little embarrassment in the way as possible.

By order State Board of Health,

C. W. CHAMBERLAIN,
Secretary and Supt. of Vital Statistics.

A quarterly meeting was held Oct. 16, 1878, present, Drs. Butler, Lindsley, and Chamberlain, and Prof. W. H. Brewer. A telegram was received from Dr. Hubbard, stating that he had been sum-

* In accordance with this law, New Haven, Hartford, and perhaps other towns, have enacted by-laws by which more prompt returns of deaths are secured.

moned as a witness in a trial then pending. Communications were presented from Guilford relating to the typhoid fever prevalent there among the members of the Guilford Battery recently encamped at Niantic. Thirteen out of twenty men were sick, and there had been two deaths. No other cases were known in Guilford, or in others of the militia who had been encamped. Drs. Lindsley and Chamberlain were appointed to investigate the origin of the trouble.

The following letter was read by the secretary:

LAW OFFICE OF JOHN H. GLOVER,
No. 110 BROADWAY, NEW YORK, Sept. 27, 1878.

My Dear Sir,—As owner of a residence and property in the town of Fairfield, Conn., I address you with reference to the drainage of said town. Some years ago the water of a pond in the center of the village was drained by the town authorities into a piece of low ground in the rear of my house. No provision was made for conveying the water from said pond, as well as drainage from other parts of the village running into the same locality, into the Sound. An old creek which in former times was the natural outlet was stopped many years since, the ditches in the low ground between my house and the beach are clogged, and they and a pond back of said beach are in a stagnant condition. A civil engineer whom I employed to examine the matter reports, after a careful survey, that a perfect drainage can be effected by a tide-gate and pipe through the sand into the Sound. A great and increasing number of cases of chills and fever and malarial complaints now prevail in the village and neighborhood. I am induced to write to you in hopes that a remedy may be suggested and enforced by your direction. Please inform me if you, or one of the members of the State Board of Health, could meet me at Fairfield to view the situation. If so, an early day would be advisable. A line addressed to my office in New York, as above, would oblige me, and I would take pleasure in meeting you on such day as might suit your convenience.

Very truly yours,

JOHN H. GLOVER.

C. A. LINDSLEY, M.D.,
Committee of State Board of Health of Connecticut.

On motion of Prof. Brewer the secretary was directed to correspond with Mr. Glover, and, if deemed expedient, investigate the alleged evil. It was also voted that upon the authentic report to the secretary of any epidemic or endemic disease requiring investigation, or upon any application from responsible citizens for sanitary work, he be authorized to enter upon such work at once, and if deemed expedient or necessary, to call special meetings of the Board.

The secretary read a monthly sanitary report, as the first of a series of monthly reports to be published in the daily papers. The report was accepted, and the plan approved. These reports were designed to form the basis of a report on epidemic, endemic, and contagious diseases by the secretary, for each annual report.

The following form was adopted :

STATE OF CONNECTICUT.—RETURN OF A BIRTH.

To be made to the Registrar within the first week of the month next after the birth.

I certify, from the best information which I can obtain, that

1. Full name of child,
2. Place of birth,
3. Date of birth,
4. Sex of child,
5. Name of father,
6. Residence of father,
7. Occupation of father,
8. Birthplace of father (town, state or country),
9. Color* father,
10. Age of father,
11. Maiden name of mother,
12. Birthplace of mother (town, state or country),
13. Age of mother,
14. Color* of mother,
15. Number of child,
16. Number of children now living,

Remarks. If twins or illegitimate, so state.

Signature of physician or other person making the return.

Dated at , *on this* *day of* 187 .

Make a return for each child in case of twins. If stillborn, state age of fœtus.

[Be very particular to fill all blanks.]

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* If other than white.—(A.) African: (M.) Mulatto; (I.) Indian. If of other races, specify what.

The following books have been presented to the board, or purchased for its use :

Transactions Connecticut State Board of Education. Presented by the secretary, B. G. Northrop. 1871–8.

Transactions New York State Board of Charities, 1871–1878. Presented by the secretary, J. O. Fanning.

Transactions Massachusetts Bureau of Labor Statistics, 1874–

1878 : Census of Massachusetts, 1875. Presented by Carrol D. Wright.

Transactions Massachusetts Board of State Charities—Third to Fifteenth. Presented by F. D. Sanborn.

The Sanitarian, vols. 1–6.

Transactions California State Board of Health, 1st to 6th.

Transactions Michigan State Board of Health, 1877–78.

Reports of Medical Officer of the Privy Council, England—complete set.

Transactions Massachusetts State Board of Health, 1878.

General Statutes and Public Acts of Connecticut.

Hassal on Food and its Adulterations.

Bayles on House-Drainage.

Report of Board of Health of Brooklyn, N. Y., 1875–1876. Presented by J. M. Wyckoop.

Transactions State Board of Health of Wisconsin, 1876–77.

Transactions State Board of Health of Mississippi.

Report of U. S. Marine Hospital Service. J. M. Landers.

Charter and Revised Ordinances, New Haven.

Charter and Revised Ordinances, Bridgeport.

Charter and Revised Ordinances, Norwich.

Annual Reports, Meriden.

Transactions State Board of Health of Louisiana.

Transactions Board of Health of Reading, Pa.

Transactions Board of Health City of Boston.

Transactions State Board of Health of Colorado.

Transactions State Board of Health of Minnesota.

Transactions Board of Health City of New Haven.

Registration Reports City of Providence, R. I., 1874–76.

Rhode Island Registration Reports. Presented by Dr. E. M. Snow.

Blyth's Dictionary of Hygiene.

Cameron's Manual of Hygiene.

McDonald's Microscopical Examinations of Drinking-water.

On the Adulteration of Milk. H. A. Mott.

Studies on the Laws of Life. State Medicine in its Relations to Insanity—The Treatment of the Insane—Claims of the Sick Poor—The Prevention of Insanity. Presented by Dr. Nathan Allen.

Transactions Georgia State Board of Health.

Carpenter's Preventive Medicine.

Transactions Board of Health, District of Columbia.

TREASURER'S REPORT.

EXPENDITURES TO DECEMBER 1, 1878.

Printing,	$198.21
Postage,	49.00
Traveling expenses,	64.56
Stationery,	19.95
Books,	30.00
Blanks for Vital Statistics,	34.75
Salary Secretary one quarter,	250.00
	$546.57
Cash on deposit,	203.43
	$750.00

RECEIPTS.

By Cash,	$750.00

Bills outstanding, mainly for Department of Vital Statistics, about $200.

C. W. CHAMBERLAIN, *Treasurer.*

Examined and approved.

C. A. LINDSLEY, *Auditor.*

STATE PREVENTIVE MEDICINE.

THE FIRST ANNUAL ADDRESS

TO THE

STATE BOARD OF HEALTH

OF CONNECTICUT,

BY JOHN S. BUTLER, M.D.,

LATE PHYSICIAN AND SUPERINTENDENT OF THE CONNECTICUT RETREAT FOR THE INSANE, AND HONORARY MEMBER OF THE MEDICO-PSYCHOLOGICAL ASSOCIATION OF GREAT BRITAIN,

PRESIDENT OF THE BOARD.

"Health is the greatest of all possessions, and it is a maxim with me, that a hale cobbler is a better man than a sick king.—*Bickerstaff.*"

"A change has come over the science of medicine; with true nobleness of purpose, true medicine has been the first to strip herself of all mere pretences to cure, and has stood boldly forward to declare, as a higher philosophy, the prevention of disease. The doctrine of absolute faith in the principle of prevention includes the existence of a higher order of thought, of broad views on life and health, on diseases and their external origin, of death and its correct place in nature. . . . The science of prevention becomes a political and a social, as well as a medical study."—*Dr. Richardson.*

"We stand now at the very dawn of the grandest epoch yet seen in the progress of medicine. While philosophically, accurately, and with the most minute skill studying by means of physiology, pathological anatomy, chemistry, the microscope, and above all, by careful clinical observation, the natural history of disease and the effects of remedies, our art at the present day looks still higher, viz., to the prevention of as well as to the cure of disease. And this is to be done by sanitary organizations throughout each State, the nation, the laity, and the profession heartily joining hands in this most noble cause. . . . If by such means one-third or more of the sickness and the suffering consequent thereto can be averted; if the rate of mortality can be very sensibly diminished, public health everywhere greatly improved, and human life prolonged, 'the glorious triumphs' predicted by Dr. John Forbes, it may truly be said, 'are being achieved.'"
—*Dr. H. I. Bowditch.*

"Power can be generous. If our mechanic arts are unsurpassed in usefulness; if we have taught the river to make shoes and nails and carpets, and the bolt of heaven to write our letters like a Gillott pen, let these wonders work for honest humanity, for the poor, for justice, genius, and the public good. Let us realize that this country, the last found, is the great charity of God to the human race. . . . Humanity asks that government shall not be ashamed to be tender and paternal, but that democratic institutions shall be more thoughtful for the interests of women, for the training of children, and for the welfare of sick and unable persons, and serious care of criminals, than was ever any the best government of the old world."—*Ralph Waldo Emerson.*

STATE PREVENTIVE MEDICINE.

State Preventive Medicine is the now generally accepted term for what has been known as the science of public health, or hygiene. It has received various definitions; that which gives it the widest signification will best express the province which is now generally assigned to it. Dr. Mapothers, an eminent authority, defines it as "an application of the laws of physiology and general pathology to the maintenance of the health and life of communities by means of those agencies which are in common and constant use." Sander, a recent German writer, gives the definition as "the care the State may reasonably be expected to exercise over the health of the individual by himself, and in his relation to the community." Another, which I think better covers the whole ground, and is in part by Dr. Smith of New York, makes it the power to protect the people from pestilence, whether foreign or domestic; to discover and remove the causes of disease within and around their houses, to promote the general health of communities, and plainly to point out the ultimate relation between their physical condition and their moral and intellectual position. State Boards of Health are the executive officers of State Preventive Medicine—or in other words, the machinery by which its principles are applied to practice.

It is not, as is generally supposed, of modern origin, but dates back to remote antiquity. The Mosaic, the most ancient of all codes, embraces the wisest sanitary laws as a prominent part of those given for the religious guidance of the Jewish people. The remains of the aqueducts, sewers, drains, public baths, and street-pavements of ancient Rome, and the traces left in the ruins of private houses, of appliances for ventilation and drainage, many so thoroughly constructed as still to be in excellent preservation, testify to the recognition of the same laws by the Romans.

The laws of Lycurgus, says Dr. Gairdner, are not wanting in many very pointed enactments on sanitary matters; and the importance attached by all the Greek republics and in the ideal Platonic polity, to physical culture, is well known. Thus the Jews, the Greeks, and the Romans, the most manly of all the races of mankind, owed to the temperance and simplicity of their lives and their obedience to the laws of preventive medicine, that vigor of body and energy and decision of mind which made them so invincible in war, so wise, self-reliant, and progressive in all the arts of peace, and gave them in turn the merited and proud rank of the dominant nation of the world. We learn from the Justinian Code that a corps of State Physicians was early appointed in the Roman Empire; there were ten of them in the largest towns, one to each district or subdivision; seven in towns of the second order, and five in the smaller ones. They collectively formed a college, whose duty it was to attend to the public health.

For centuries after the decadence of the Roman Empire, we trace in the history of the world no recognition of the necessity of any sanitary provision. Pure air and pure water, ventilation and drainage, and all the other essentials to health, seemed unheeded. The monk, holding in his watchful and oftentimes miserly keeping the manuscript records of our holy religion, was almost the only one who cared to clothe the naked, feed the hungry, build hospitals for the sick, and dispense sadly needed charity to the poor and suffering. The preacher of righteousness, he was generally also the illustration of personal filthiness. The causes of disease were unknown, and consequently unchecked; and the frequent and terrible epidemics which often more than decimated the nations, were considered special manifestations of the wrath of God. The history of England or of Europe gives little evidence of any material advance in this department of civilization, until the nineteenth century. Up to this time we find only the repetition of the same sad story of sensuality and apathetic ignorance, of cruel oppression and servile submission, of the absence of all human sympathy, and the measureless waste of human life.

In the advance of civilization, England was the first nation to learn that the penalties for all violation of the physical laws are as inevitable as those of the moral laws; and that all true national progress would be in proportion to the due recognition of each.

The plague, small-pox, fever and ague, on land, the scurvy on shipboard, with other results of the universal neglect of all sanitary care, diminished the national resources and crippled the national strength. She began to realize that pestilence was no more a special visitation of Divine anger than war, and was alike to be anticipated and avoided, or wisely and efficiently met. During the last century something was done in Europe, and more especially in England, to improve the sanitary condition of the larger cities and of the more densely populated manufacturing and agricultural districts. But this, almost the first step in the modern recognition of sanitary science, was tardy and incomplete; its laws were imperfectly understood, and the efforts to apply this scanty knowledge were without intelligent system or efficiency. The epidemic of cholera in Great Britain in the year 1832, in its practical teachings and ultimate results, proved the starting-point of a great advance in hygienic reform. Its distinct and novel selections of certain peculiar localities as the best prepared and fitted for its ravages, its uniformly greater prevalence and fatality among the poor, the degraded, and the filthy, than among those classes where the comforts and the decencies of life were found, its very general avoidance of the latter until it had acquired an accumulated virulence and power by its malignant growth among the former, all united in demonstrating to the government the vital necessity of an immediate and thorough investigation into the causes and possible means of prevention of a pestilence so fatal to national prosperity and life. The right measures were promptly taken. Government commissions were appointed, thorough investigations were made, and the results, carefully and accurately collated, were at once given to the public. The very able and comprehensive governmental report published in 1842 on the sanitary condition of the laboring population of Great Britain, is universally acknowledged to be the true starting-point of modern sanitary legislation. In 1844–6, valuable reports were made by a "Health-of-towns commission." and in 1847–8, reports of a like character by a similar commission. The passage by the British Parliament of the Public Health Act of August 21, 1875, "condensing and amending the previous acts relating to public health in England," is considered by Dr. Bowditch (*our* highest authority) the most important enactment of any nation in modern times.

These reports were the results of the oftentimes imperfectly appreciated or compensated labors of a few earnest men. In this

connection, the names of Mr. Simon, Thomas Chadwick, and Dr. William Farr (the celebrated Registrar-General of Great Britain), have especially become historical. Of the latter gentleman, Dr. Gairdner, himself of the highest authority, writes: "He found the facts of this science in a state of almost hopeless and aimless confusion, and has not only added immensely to their number and value, but has brought into them light, harmony, and order, and for the first time in the history of the science, a determinate method and an approach to scientific exactness; by his system of calculating death-rate, he has given his professional brethren an easy and useful method, and by the formation of life-tables, he has greatly facilitated the operations of life insurance." I quote this tribute to the labors of Dr. Farr, as in the great work before us it will be cheering to know the origin of the pioneer work so helpful to our own present necessities and progress. These details of that efficient combination of individual and legislative instrumentality to which we owe the great advance of sanitary science in Great Britain, as well as the increasing interest in sanitary reform throughout Christendom, will illustrate the important truth, that it is only through this union of the action of the people and the legislature, that these results, so essential to the highest civilization, can be obtained.

On the continent of Europe sanitary science is exciting much interest. The governments of most countries, especially of France, Germany and Italy, are recognizing its national importance by official action. And governmental agency sustained by that of individuals, humane societies, and scientific associations, is giving the best of promise that this great reform, so prominent in its importance, so far-reaching in its aims, so necessary to individual welfare and to national prosperity, is about to be accepted as a vital factor in the progressive civilization of the age. These claims for its high merit will not seem extravagant or unreasonable to those who have studied its obtainable results.

In this country, Massachusetts, as often in other questions of public utility and advancement, took the lead in establishing in 1869 the first State Board of Health in the United States. The history of that board is instructive. In the year 1850, Lemuel Shattuck of Boston, made a report to the legislature of Massachusetts on sanitary reform, which showed singular foresight and wisdom, but was so far in advance of his times, that as Dr. Bowditch remarks, "it fell still-born from the press." It was, how-

ever, good seed, buried, but not dead. Twenty years afterward, through the enthusiastic and untiring efforts of Dr. Bowditch, seconded by the energetic aid of Dr. Jarvis of Dorchester, and the Hon. Thomas F. Plunkett of Pittsfield, and others, the good seed bore this good fruit—the first American State Board of Health.

It is not, I trust, tracing results back to a too remote cause, if I add that Mr. Shattuck's report also gave its inspiration to the first report of the Massachusetts Board; which was from the pen of its first secretary, the late lamented Dr. George Derby of Boston,—a most able and influential document which gave a new impulse to hygienic reform, and still remains a text-book and model for us all. The annual Reports of the Board of Health of this our neighboring State have been continued regularly since 1869. They embrace the results of extensive and careful investigations into the various departments of public health, and like the Privy Council Reports of Great Britain, form an invaluable library of reference for the help of those who are following in the path they have pointed out. The last annual report of the Massachusetts Board (for 1878), contains an important paper upon "Drainage and Health, Sewerage and the Pollution of Streams, including the draft of a Law,"—a document which gives us the result of the examination made upon these subjects by a special commission of scientific and practical men appointed by the governor of the State. This commission spared no needed time, labor, or expense, their investigations were sharp and thorough, they reached every city, and nearly every town in the State; especially every locality where they found any unusual prevalence of sickness, increased death-rate, any suspicion of sanitary neglect, or any complaint of sanitary defect or nuisance. Their report accepted by the Legislature, and sanctioned by the highest legal authorities of the State, must have great weight everywhere, especially in aiding the adjustment of the difficult, embarrassing, and conflicting claims of rights, privileges and long-time uses connected with ponds and watercourses. The increasing density of our population in city and country, and the extension of manufacturing establishments of various kinds, give an increased importance to the question, how far *any* interference with the purity and the domestic uses of water can be considered equitable or legal. The report we refer to, liberally illustrated with maps, plans, sketches, etc., is justly considered exhaustive. The valuable mass of facts and suggestions to be found in the series of reports of the Massachusetts Board is in

that higher line of political economy, which is sure to lead a State to increased power and wealth.

Here, as in England, the most efficient of the pioneers of sanitary reform were not from the active members of the medical profession, but from the laity. What Mr. Simon and Thomas Chadwick have been and happily still are to this cause in England, Lemuel Shattuck has been in the United States. Most ably and earnestly have these leaders been seconded by the medical profession in both countries. Thus we see that this is not a subject of limited and exclusive interest, or dependent solely on the aid and sympathy of any class, for its successful inauguration or progress. It is eminently a work for the coöperation of many allied forces; the profession and the laity; the individual and the State. In this alliance alone can success be obtained; in this, it is certain.

We find one of the good signs of the times in the rapid and widespread interest in sanitary reform, which has of late been developed in nearly all parts of the United States. State after State has caught the salutary influence of the example of Massachusetts; leading men, especially in the medical profession, are giving it their active support; the people at large are beginning to recognize the safer, better, and cheaper policy of prevention than of the cure of disease, and to understand that the causes of many of the most dangerous diseases are palpable, easily recognized, and easily avoided.

It remains for Congress to recognize the importance of this subject, and make the "Health Department" a function of the National Government; as it is only through a united and organized system that the best national results are attained.

A Department of Public Health, with a well-defined code of sanitary law, will be established when the people appreciate its far-reaching influences; that both disease and crime come from the same tap-root of pauperism which naturally springs up from the subsoil of filth and unsanitary conditions underlying all, and involving other interests than those simply of physical health. We can see no reason why a public alarm should not be as quickly given for an outbreak of epidemic disease as for an outbreak of fire, and as thorough an organization be provided to meet the one as to combat the other. It is simply the larger application of the common-sense system of prevention. We accept the axiom of military men, that the power of an army is in the health of the soldier, and though the calls for active service are brief, and it is

to be hoped at increasingly long intervals of time, it is the accepted duty of the Secretary of War to keep up the discipline and efficiency of the army at all times. "The fighting time for which a Secretary of Health and his organization would have to prepare is daily and continuously. It would be with him as if an invading enemy were constantly to be met, and every year a great battle was to be fought."* At the present time civilization is fighting these battles all over the world, and for the most part losing them, as in that unobstructed invasion of Great Britain in 1832, by cholera, which proved so destructive of life and property, and also as, during last summer, yellow fever found free admission to our principal southern port without inspection or quarantine. That fever, once admitted, found in the accumulated filth of city, town, and country, such an abundant material for the reception and development of its poison-germs as to defy all prevention or remedy. The consequent loss of life is counted by thousands, the loss of property by millions of dollars; the desolation of households, the consequent suffering, etc., cannot be measured or counted. Cholera has of late years repeatedly visited the ports of Great Britain, and sanitary regulation has restricted it to the infected vessels. Sanitary science claims that the due enforcement of its laws, thorough, rigid quarantine and other precautions, can prevent the importation of any epidemic disease, or limit its ravages, and thus avert such fearful waste of life and property.

Having given the accepted definitions of the science of State Preventive Medicine, and a brief sketch of its rise and progress, we are brought to the questions, What are the specific duties it prescribes? What loss has been sustained by their neglect? What has it already done? What more does it propose to do? and What are its reasonable possibilities in the future?

We have seen that this science was ancient in its inception, and, though long dormant, has of late begun to obtain due recognition of its momentous importance, ranking among its numerous friends and advocates an increasing number of eminent statesmen, scientists, and philanthropists, and in all civilized countries moreover winning to its cordial support many who, from an honest misapprehension of its character and aim, were for a time indifferent or opposed. It now comes before us, claiming the power to prevent disease, prolong the duration of human life, and, in its ultimate reach, to increase the well-being and happiness of the nations. This it seeks to do

* Dr. Farr.

by giving a higher aim and efficiency to the powers of civilization through the removal or diminution of evils which now deteriorate the race or hinder its progress.

The duties it prescribes are well defined in the succinct language of the Act creating this Board:

"The said State Board of Health shall take cognizance of the interests of health and life among the people of this State; they shall make sanitary investigations and inquire respecting the causes of disease, and especially of epidemics, the sources of mortality, and the effects of localities, employments, conditions, *ingesta*, habits and other circumstances upon the public health; and they shall collect such information in respect to these matters as may be useful in the discharge of their duties, and contribute to the promotion of health and the security of life in this State; they shall cause to be made by their Secretary, or by a Committee of the Board, inspections at such times as they may deem best, and whenever directed by the Governor or the Legislature, of all public hospitals, prisons, asylums, or other public institutions, in regard to the location, drainage, or water supply, disposal of *excreta*, heating and ventilation, and other circumstances in any way affecting the health of their inmates, and shall also suggest such remedies as they may consider suitable for the removal of all conditions detrimental to health."

These duties are also marked out by Cameron as "mainly to procure supplies of pure water, to prevent the pollution of air and water by foul liquids, gases, vapors, and dirt of all kinds; to prevent over-crowding of dwellings, to see that the houses of the laboring classes are in perfectly tenantable order, to check the sale of adulterated, diseased, or otherwise unsound food, to cleanse the streets and roads, to prevent the spread of contagious diseases, to bury the poor, to provide burial places for rich and poor, and to disinfect and to provide dwellings for artisans." The German code is still more minute and comprehensive.

It is meant furthermore, that the best knowledge bearing upon the illustrations and teachings of this science, and upon the legislative action necessary for its furtherance, shall be published in a plain and economic manner, and be freely distributed throughout the community, in order that the people may be educated in respect to the nature and causation of diseases, the means of prevention, and generally the danger of ignorance, neglect, or disobedience of the laws of hygiene." This diffusion of

knowledge is truly the first and gravest duty of all; other measures following in due course the right discharge of this primary duty. In the words of an eminent English statesman,* "No sanitary improvement worth the name will be effective, whatever acts you pass, or whatever powers you confer upon public officers, unless you can create an intelligent interest in the matter among the people at large. The State may issue directions, municipal authorities may execute to the best of their power, inspectors may travel about, medical authorities may draw up reports, but you cannot make a population cleanly or healthy against their will, or without their intelligent coöperation. . . . This is why, of the two, sanitary instruction is even more important than sanitary legislation." At this time, when so many schemes of reform and philanthropy (falsely so-called), are dinned into the public ear, any new claim, urged not only on the people but on the government of the State for adoption and support, should of right be submitted to the sharpest scrutiny, and to the rigid requirement of satisfactory evidence.

Dr. Richardson says: †"I want strongly to enforce that it is the section of the nation which Dr. Farr classes as the domestic—the women—on whom full sanitary light requires first to fall. Health in the home is health everywhere; elsewhere it has no abiding-place. I have been brought indeed by experience to the conclusion that the whole future progress of the sanitary movement rests for permanent and executive support on the women of the country. When as a physician I enter a house where there is a contagious disease, I am, of course, primarily impressed by the type of the disease and the age, strength, and condition of the sick person. From the observations made on these points I form a judgment of the possible course and termination of the disease, and at one time I should have thought such observations sufficient. Now I know them to be but partly sufficient. A glance at the appointments and arrangements and managements of the house is now necessary to make perfect the judgment. By this glance is detected what aid the physician may expect in keeping the sick in a condition most favorable for escape from death; and by this is also detected what are the chances that the affection will be confined to

* Lord Derby.

† Address on the "Future of Sanitary Science," before the Sanitary Institute of Great Britain, July, 1877.

one sufferer or distributed to many. As a rule to which there are the rarest exceptions, the character of the judgment is hereupon dependent on the character of the presiding genius of the home, on the woman who rules over that small domain. The men of the house come and go; know little of the ins and outs of anything domestic; are guided by what they are told, and are practically of no assistance whatever. The women are conversant with every nook of the dwelling, from basement to roof; and on their knowledge, wisdom, and skill the physician rests his hopes. How important, then, how vital that they shall learn, as a part of their earliest duties, the choicest sanitary code."

As a timely illustration of the correctness of this judgment, I may be permitted to state, on the authority of Dr. Bowditch of Boston, that the movement which resulted in the establishment in Massachusetts of the first Board of Health in the United States, originated with a lady of Pittsfield, (Mrs. Thomas F. Plunkett,) who had been intimately connected with the Maplewood Seminary in that town at the time of the well-known outbreak of typhoid fever in that institution, and was an intelligent observer of those violations of sanitary law which led to such disastrous and fatal results.

In fairly measuring what sanitary science has done and can do for the people, we are to take into consideration all those powers, values, and indeed sympathies, which are the real vital elements of the State, and which must exist in due proportion to make the best whole. We are also to take the right estimate of another element of public or State property, whose full measure of worth political economists have only of late been ready to admit, the money value of each healthy life, acknowledging the soundness of that axiom of finance as well as of political economy, that public health is public wealth.

In their best conditions, air, water, food, clothing, house construction, drainage, and more indirectly soil and climate, each with individual importance and mutual relation, are positive factors of the best health assurance. This is demonstrated by that which is the ultimate standard and measurement of sanitary results,—the diminished death-rate, that diminution being in due proportion to those best conditions. In further illustration of these measurements, let us compare the sanitary condition of the people of England in the last century with that of the present time; the utter neglect, then, of drainage, sewerage, and ventilation, of purity and plenty of air

and water, of personal cleanliness, of the removal of filth accumulations, with badly-constructed dwellings, poor and insufficient food and clothing, all leading to their natural results in the frequent recurrence of zymotic (epidemic and contagious) diseases, and the unrestrained prevalence of all other forms, with a corresponding death-rate of about 1 in 23, against about 1 in 40 at the present time; the death-rate being at all times the most reliable flood-mark of diseased conditions.

To-day, by the establishment of government boards, and the employment of able and learned men as the inspectors, "full," as Dr. Bowditch says, "of the enthusiasm and accuracy of modern science, England has made an immense stride towards having a perfect system of sanitary guardianship of the realm." The reports of her unrivalled system of statistical investigations enable us to measure with a good degree of precision what State Preventive Medicine has already accomplished there. In all the conditions above specified, especially in regard to the removal of filth, as in the recognition of the fact that the germs of vice, as well as of disease, are developed from filth, extraordinary advances have been made. Epidemics and contagious diseases have either been prevented or kept within narrow limits; some diseases have disappeared, and the frequency and fatality of others have been largely diminished. Consequently the general death-rate has fallen to a much lower figure. Of course, these conditions are not universally regarded; in many locations are found overcrowded dwellings, an abundance of filth and vice, and the neglect or defiance of all sanitary law, and consequently in such places there is no diminution, but an increase of sickness and of the death-rate,—the difference in the latter between the most healthy district and the least in the same city, varying sometimes from twelve to fifty or even sixty in 1,000. Mr. Chadwick* says: "We have gained the power of reducing the sickness and death-rate of the old cities by one-third ; . . . of the death-rate in the old settled country districts to 16 or 17 in 1,000 ; . . . in the new districts, with complete systems of water-supply, drainage, etc., to less than one-half, or a mean rate of 10 to 1,000, and of sickness in due proportion in both; . . . in prisons and other places under sanitary control, and in the large collection of indigent and dependent children in schools and insti-

* Paper read before the British Social Science Association in 1877, on the chief results of the progress of Sanitation.

tutions, to 3 in 1,000, or one-third of the death-rate prevalent among the general population of the same ages, while fully one-half of the diseases of the pulmonary organs in the general population may be prevented by public sanitation." Mr. Chadwick also enumerates many other points of gain and advancement. The result of these national reforms is an equal advance in the material, financial, physical, and moral power of the whole kingdom; a striking illustration of the correctness of the accepted axiom that the health of the people is the first object of good government.

We have thus dwelt upon what has been accomplished in England, as the admirable reports of the British Parliament are unrivalled in their thoroughness and fullness of detail, as well as soundness of conclusion, and are our best instructors and guides. But sanitary reform embraces a wider field; it has availed itself of the researches of science to teach us the quantities and the qualities of air demanded by the best sanitary conditions; its impurities, their sources, and the means of their detection and avoidance, as in proper heating and ventilation, and the intimate relation of these deficiencies and deteriorations to various diseases, especially in the necessities of tenement-houses, prisons, mines, schools, the rooms of the sick and the poor, the workshops of the various trades, and all places where any impediment exists to the free circulation of pure and dry air, as in rooms occupied by many, or by laboring or diseased persons.

As an illustration of these positions, Dr. Carpenter has shown that the fatality in the well-known Black Hole in Calcutta, in the prisons in which the Austrians were confined after the battle of Austerlitz, and in other well-known instances, were not caused, as has been generally supposed, by the excessive generation of carbonic acid gas, but by the "poisonous agency of the organic matter always found in air rendered fetid by the prolonged respiration and cutaneous exhalations of a crowd of human beings, and by the deficiency of the oxidation, and the consequent increase of putrescent matter in the body." It has been shown that consumption often has its origin not only from continuous exposure to dampness of the air, but also from air rendered impure by other, even healthy, persons occupying the same close or unventilated room, or what is still more dangerous, sleeping in the same bed or bedroom with a consumptive patient; for it is admitted that the air of a close and crowded room may be as effectually poisoned by

the prolonged respiration and cutaneous exhalations even of persons in good health, as by the introduction of sewer-gas.

The specific poisons (whatever may be their ultimate form) of small-pox, typhus and scarlet fever, measles, and diphtheria, yellow fever, etc., pass off into the air and are thus diffused and communicated. Dr. Parkes, speaking of the organic substances floating in the atmosphere, and giving rise to a large class of diseases, says "that it remains to be decided in what exact condition this organic matter exists, . . . whether it is always contained in the substances discharged or thrown from the body as in small-pox, or is produced by putrefactive changes in these discharges, as is supposed to be the case in cholera and dysentery. . . . This much is known, that they differ in the readiness in which they are rendered harmless. While typhus and Oriental plague throw off a poison which, if there is due ventilation, is readily destroyed, the poison of small-pox and scarlatina, spreads in defiance of free ventilation, and retain their virulence for months." It is accepted that the air fouled by these germs of disease is the agent of their communication. The researches of science have also taught us that the water-supply demands equally careful scrutiny in regard to its purity and the abundance of its sources, whether from rain-falls, rivers, springs, or wells; the limit within which organic matters may safely be held in solution; the character of the matters thus held; the quantities necessary to be supplied for various domestic uses, cleanliness and sewerage; impurities and their origin, and the increasing danger of the pollution of any source of water supply by the filth from privies, sink-drains, cesspools, barnyards, leaky sewers, slaughter-houses, and especially of rivers and ponds from direct sewer openings, and the deposit therein of poisonous, noxious, or polluting refuse from many manufacturing establishments.

It has been proved that any continued poisonous agency in a dwelling-house, for instance an amount of sewer-gas so small as not to be perceptible to the ordinary sense of smell, or the use of well water poisoned by infiltrations from neighboring sinks, drains, privies, cesspools, sewers, etc., in so small a degree as not to affect its taste or relish, or apparent purity, may acquire such an accumulative power as ultimately to produce deleterious or even fatal effects, especially upon children and delicate or susceptible adults.

Another most important hygienic advance is the cognizance of the sanitary as well as moral evil influence of badly-constructed

tenement and other dwelling-houses of those classes whose poverty compels them to seek the lowest rate of rent. Chambers says "that there can be no doubt that the frequency and fatality of epidemics of the middle ages were in a great measure due to unhealthy habitations; the houses were often closely packed in crowded streets, and were often built for the purposes of defense and at a sacrifice of ventilation, drainage, and light. At the present time, with all our boasted civilization, the dwellings of the poor, in our large cities, towns, and villages, are too often a disgrace to humanity." Both in this country and in England, benevolent individuals (as well as some landlords with a view to safer investment), have of late erected dwelling-houses for the poor in which the hygienic conditions of ventilation and drainage, air, water, and space, with all possible *sunlight*, dryness, and consequent cleanliness, are made to combine with rigid regulations, low rents, and unvarying promptness of payment. It is cheering to hear that an extension of this scheme is under the united consideration of wise and benevolent capitalists, and some of our most intelligent architects. It is claimed that the poor can be provided with sanitary habitations at no higher rent than they are now compelled to pay for garrets and cellars. The problem to be worked out is to construct dwelling-houses containing the best combination of domestic necessities, security of physical and moral health, cheapness of rent, and soundness of investment.

New light is also being thrown continually upon the relation between disease and other agencies, such as those of soil and climate, in the direct and marked effect of dampness and low and circumscribed localities, especially in the development of consumption. and of the cutting down of forests and belts of trees, and the breaking up or change of the surface of the ground, in the prevalence of malarial epidemics. The recent literature of the science is full of illustrations of the newly-discovered power of these, and of many other large, though less influential agencies.

It is evident that to measure aright what State preventive medicine has already effected, we must add to the money value of the lives which the accurately measured death-rate proves to have been saved by its agency, the amount saved by the diminution of expense of sickness, and that gained by the relief from suffering, and the prolongation of a healthy life, provided we can find any due exponents to express such values. When we thus review what sanitary science has already done in the better instruction of

the people, as to the causes and the often easy means of prevention of disease in general, and especially of the national calamities of epidemics, in the decrease of sickness and its cost in money and suffering, and in a large diminution of the general death-rate, we may well be surprised at the opposition it has ever had to encounter. We look forward to the greater work it has yet to perfect, and fear that the general acceptance of its teachings, which is sure by and by to come, will demand, as in the past, the needless but terrible lessons of such epidemic visitations as the plague, cholera, yellow fever, small-pox, typhoid fever, scarlatina, diphtheria, diarrhœa, dysentery, and also the various forms of cattle-disease, to teach us by loss and affliction, that sanitary reform, in its medical, legal, and economic affinities, is as nearly allied to Christian duty as to political economy. We shall learn that it is no greater violation of the law of God to permit open-faced vice and crime to degrade the moral sense of a neighborhood than to suffer an undrained and ill-ventilated, densely and foully crowded tenement-house to propagate disease among its inmates; that the laws of heredity are not limited to the continuance of physical disorders alone, but that pauperism in the parents as naturally leads to vice and crime in the children as to disease; that moral and physical evils are alike transmissible, and may and do pass down by a well-known law of inheritance from generation to generation.

The term "State preventive medicine," in its right sense, has a wider range than is generally accepted. It is by no means limited simply to the relation of filth to disease. Ruskin founds the strongest arguments in its favor upon the axiom, that "whatever increases the length of life, increases public wealth; whatever improves health, improves morals." The moral, intellectual, and physical natures of man are of near kindred, and of mutual dependence; the ebb or flow of each alike moves the other. Especially is this seen in the connection between the sanitary condition and that trinity of evil sequences,—pauperism, vice, and crime. This relationship, in its far-reaching results, is to-day the gravest and most difficult question before the friends of good government and social progress.

I accept the distinction between honest poverty and pauperism. "The poor we have with us always," and Christian charity accepts the implied obligation in behalf of those who need our aid rather through misfortune than through their own fault. Pauperism is in chronic alliance with indolence and vice. Filth, prolific as it is

of evil, yields the place of preëminence to pauperism; for, in some of the older cities of Europe, filth, in some quarters, appears to be almost the normal condition, without the seemingly inevitable sequence of epidemic disease.

When the Commonwealth charged this Board to take cognizance of the best interests of the health and life of its citizens, it simply expressed a broader recognition of that accepted duty which has heretofore led it to pass and enforce laws for the protection and advancement of their moral, intellectual, and material benefit, as now for their physical. It wisely establishes and supports a system of public education, indorses the departments of police and fire, regulates the movements on our railroads and highways, and, in short, reaches out its paternal carefulness (though not always in the highest wisdom) in a multitude of ways; but while doing all this, it suffers our streams and water-supplies to be polluted, does not compel vaccination, and suffers children and others from families infected with diphtheria, scarlet fever, and other contagious diseases, to enter our public conveyances, churches, schools, and social meetings, without hindrance, ignoring the fact that the infinitesimal germs of disease may be communicated, not only by contact with a diseased person, but conveyed by the clothing, and retained by the furniture of the sick-room; and tolerates, in the very heart of our cities, open sewers with obstructed flow, whose consequent settlement and putrefaction give rise to deadly miasms! In brief, we suffer pestilence to contaminate the air we breathe, and the water we drink; to walk our streets and enter our dwellings not in darkness only, but at noonday, and this without fear or protest; while we make careful provision for the alarm of the locomotive whistle and the fire-bell!*

The prevention of indiscriminate charity also has to do with the science whose vital importance I am urging. Alms-giving at the door, in the street, or elsewhere without accurate knowledge or concerted action, is a prolific source of pauperism and crime. It discourages honesty and industry, and offers a premium to indo-

* A recent act of Parliament gives the largest cities of Great Britain power to take possession of unhealthy localities and dwellings, etc., to insure sanitary conditions. It is high time that every large town and city should have the legal power to protect the health and business of its citizens, not only by the abolition of those plague-spots so often found where disease as well as pauperism, vice, and crime are freely generated, but by the isolation or quarantine of contagious diseases.

lence and vice. It multiplies the already large and formidable array of beggars who are at war with work and wages, and feeds a host of vagrant children suffered to be destitute of the educational, moral, and religious influences of healthy homes, leaving them to the successful training of the squad-drill of the street for the higher grades of evil doing—the boy for bolder violations of law, the girl too often to recruit the ever open ranks of prostitution, that social evil whose revenges though secret are no less terrible, reaching as they sometimes do, to the "third and fourth generation." Another example is the tramp whose outrages upon the person and property, some of which through the fear and shame of the sufferer are never proclaimed, have made the revolver almost a family necessity in many outlying and thinly peopled districts.

In this connection, and alike pressing upon us, come the grave questions regarding the sale of the ballot, the safe working of free suffrage, the equitable adjustment of the rights of labor and capital, and communism, which is well defined as the political expression of irreligion, and it may be added, of uncompromising hostility to republican government, for it is evident that the fires of the Tuilleries and Pittsburg depot were lighted by the same torch and have the same signification. All these forces of social and political disturbance unite to foster antagonism of classes, and to destroy the natural kindly sympathy and the duly recognized dependence between the rich and the poor, the consumer and the producer. Communism does not originate from unsanitary, but from far deeper and more perilous conditions; yet it finds its recruits and most reckless supporters where sanitary reform is most needed. Many political economists, apparently wise and far-seeing, are of the opinion, that we may more safely ignore fire, pestilence, or even war, than these combinations in their far-reaching and disastrous results. Thus we see that state preventive medicine is neither a professional hobby used to carry out some theory of local and doubtful utility, or to advance any narrow personal ambition, nor is it a universal panacea by which all the evils of our social system are to be remedied. It seeks the common-sense application of scientific and practical knowledge to the prevention or removal of evils needlessly yet really growing out of an advanced civilization with increased density of population, diminished simplicity of living, larger factitious wants, and undue excitements. It is in these

conditions evidently that the gravest problems of the coming years are involved.

The history of some of the most destructive of the Zymotic diseases strikingly illustrates the demands of preventive medicine.

Leprosy was so prevalent in England during the middle ages as to require a hundred regularly established Leper-Houses for its isolation. This loathsome disease is now to be met with in many countries, and its extension is only prevented by its rigid seclusion.

Scurvy is another of the destructive diseases of early times; it comes from privations and poor food, and has prevailed in armies, besieged cities, and especially on ship-board. Its ravages in former times "were most appalling, and it is estimated that more seamen perished from scurvy than from all other causes combined, whether sickness, battle, or tempest." It is said that in one year 10,000 sailors, in the navies of Great Britain, perished from this cause. Good food, vegetables, fruits, and especially vegetable acids, were found to be absolute preventives. It has, of late, again appeared, not only in the English merchant service, but on board one of the Northern discovery ships, from the culpable neglect to provide a sufficiency of these simple but effectual remedies.

The plague, a malignant kind of contagious fever, well termed one of the great historic scourges of mankind, has again appeared in Europe. This disease, historians estimate, has destroyed, during the past centuries, over 25,000,000 of human beings. It is supposed to have originated in China; under the name of the Black Death it spread through Asia and Europe in the 14th century, and invaded England in 1663–5. As late as 1720 it destroyed half the population of Marseilles, and about 1790 prevailed extensively in Russia and Poland. In 1665 the Great Plague, so graphically described by De Foe, destroyed nearly 80,000 people in London; there, as elsewhere, its ravages were unchecked; its progress was marked only by the sign of the Red Cross, and the inscription, "Lord have mercy upon us," over the doors of the infected houses, and by the cry, "bring out your dead," as the carts went from street to street collecting the death-toll of this fearful pestilence. Like a fire on the prairie, it died out for want of material to feed upon. Sanitary precautions were unknown. Its recent invasion of Europe comes naturally in the train of the privations and sufferings of war. Unknown and unlooked for by the ignorant local authorities, its first developments were unheeded. As soon

as it was recognized, the Russian government applied energetic sanitary treatment. Scientific health-commissions with plenary powers were created, rigid inspection and quarantines were established and enforced by a cordon of troops, and infected houses and their contents were burned. Austria, Germany, France, and England have taken the alarm, and consequently all the allied forces of State preventive medicine are being arrayed against the progress of this most formidable enemy. The contrast between the passive and ignorant surrender of the olden times, and the efficient and intelligent opposition now made, is a striking illustration of the progress of Sanitary Science.

Edwin Chadwick, Esq., of London, in his address before the International Congress of Hygiene of Paris in August, 1878, says:—"At the Congress of Hygiene at Brussels, a paper was given by Professor Zidekauer, consulting physician to the Emperor of Russia, in which he compares the results of the old medical treatment used in St. Petersburg during the three successive attacks of cholera in 1836, 1848, and 1855, with our system of dealing with the premonitory symptoms which they carried out closely and satisfactorily in 1866. In the first three attacks there were not less than from 47,000 to 50,000 individuals struck with cholera, of whom not less than from 23,000 to 25,000 died, that is to say, fifty per cent. In the epidemic of 1866, from 57,000 to 60,000 inhabitants were affected with premonitory symptoms, who received immediate relief; but only 15,000 had developed cases, of whom only 3,000, or about five per cent. died. This I submit as a fair result of our system."

Small-pox is well characterized as the most loathsome and destructive pestilence that ever existed, its victims being a hundred to one that perished by the plague. For years preceding the discovery of vaccination its victims were estimated at not less than 500,000 annually in Europe alone, with one-half its present population, and those it did not kill were often deformed. Vaccination has added three years to the general average of human life all over the world, and when duly enforced, and with the use of purely bovine matter, and with due seclusion and restriction of imported or sporadic cases, this disgusting disease can be as effectually extirpated from the civilized word as scurvy or leprosy. Yet by the neglect of vaccination, isolation, and all due sanitary measures of prevention, no less than 51,034 died in Great

Britain from small-pox in the ten years 1856–1865, and in the year 1864 alone the deaths were 9,425.*

In a paper read before the American Public Health Association in 1876, Dr. Lee of Philadelphia, gives an approximate estimation of the loss sustained by the city of Philadelphia from the presence of small-pox in the winter of 1871–2. This includes the loss by diminution of travel and traffic of railways, etc., in and out of the city, loss to inn-keepers, retail dealers, merchants, manufacturers, travelers, customers, shipping interest, laborers, etc. ; adding to this the value of the loss of life, loss of labor, and cost of sickness in the 25,000 cases of disease. He makes the tax thus imposed upon the city of Philadelphia to amount to not less than $24,000,000.

In 1871–72, through similar violation of sanitary law, small-pox prevailed as an epidemic in Boston and Lowell. Over a thousand lives were heedlessly sacrificed, besides the corresponding money-loss.

In these and all preceding estimates, no attempt is made to measure the consequent suffering and burden of orphanage and widowhood.

Insanity is strictly a physical disease, and comes eminently within the range of preventive medicine. When our proposed system of State sanitary registration and report is carried out, and each case is reported in its earlier stages, we may hope to obtain a more accurate knowledge of the predisposing and exciting causes of this flood of mental disorder which is filling our lunatic hospitals faster than we can or do build them. We can also more efficiently apply the means of prevention and remedy, when we can better measure its varied pernicious causes of erroneous educational and social influences, neglect of family training to reverence and obedience, sensational reading, evil habits of body and mind, idle, aimless, or sensual life, and learn more exactly as we shall surely learn, how very early in life the predisposing causes of insanity are planted in the child. In view of the relation of insanity to general hygiene I may here present the proposition that as the healthy brain-cell is to the best mental action, so is the right sanitary home to the highest physical social life. In no department of philanthropy and science during this 19th century, has greater progress been made than in the direction of the better care and treatment of the

* Chambers' Cyclopedia.

insane. Their condition in the last century is well described by a quaint old Scotch writer who says, "the better sort of ye mad people we leave to the care of the Chirurgeon, the baser sort to the taming of the scourge." Fifty years ago only half a dozen lunatic hospitals, and all of limited capacity, existed in the United States. To-day there are over eighty with most liberal provision for their 30,000 inmates. A greater work remains to be done, a work greater than cure or kindly care—that of prevention; a work which in order to be of the highest success, must reach back often to the early life, the family, the school, and the nursery.

The question before us to-day is, not only what can the State do for the chronic insane; but the wider and more timely question, how can we prevent insanity?

In my report for the Retreat for the Insane for 1860, I said: "Over three thousand cases of insanity have now come under my direct observation and care. In a large proportion of those whose histories I could obtain, I have found that the remote and predisposing causes of insanity could be traced to malign influences on childhood." The neglect of physical training, and the imperfect physical development which follows from this neglect, are strikingly evident in many of our female patients. The various causes which are reported to me as the sources of disease, and which are classified in the tables under the head of "ill health," "undue mental effort," "grief," "domestic unhappiness," etc., may very frequently be traced, in their primary influences, to the one cause of a want of physical stamina. We press the training of the mind, by all possible hours of study in and out of school, and by the added stimulus of emulation, while we neglect the training of the body, in disregard of that mysterious but absolute law of sympathy, which compels the debility of the latter to cripple the action of the former. My own observation leads me to think this error will be found to exist more frequently with the parents than with the more intelligent and advanced of our teachers; and its pernicious tendencies are beginning to be better appreciated. "I venture to say that not one girl in ten, now-a-days, enjoys really sound, rugged health; and surely that is a very unwelcome statement about those who are expected hereafter to be helpmates to husbands and mothers of children. . . . Parents and teachers both, should inculcate upon children of both sexes, the importance of health-bringing, active exercise. Boys need but little urgency,

but girls should be compelled to take it. It *is possible* for them to become of strong, vigorous health, with excellent digestion, and no nervousness.* "

In my report of 1840, I stated that of the female patients admitted during the past three years, thirty-four per cent. were the wives of farmers and mechanics—an undue proportion of the comparative number of these classes in the community. The consideration of the causes which led to this most natural result, showed that between child-bearing, nursing, the accumulation of household duties and drudgery, and the miserable short-sighted economy which often led the husband to refrain from supplying the necessary domestic assistance, the poor discouraged wife lost in turn her appetite, her sleep, and her strength; her nervous system had become prostrated, and, sinking under her burdens, she had sought refuge in the Retreat. One of our worthy female patients remarked one day to a lady, "Only think of it! they are keeping me here, and I have six children and fourteen cows to take care of at home." "Twenty excellent reasons for your remaining here until you are cured," was the timely answer. They were the twenty reasons which had made her insane. Certain it is, that a decided majority of all the cases of insanity which have come under my care during the past forty years, have arisen from easily-avoidable causes, and might therefore have been as easily prevented.

The laws of heredity are not limited simply to the transmission of disease; drunkenness, idleness, pauperism, vice, crime, come under the same laws, and may be alike propagated from parent to child; and by a well known law of sympathy, each one of these often draws one or most of the others in its train of consequences, all leading directly to the deterioration of the race.

On the other hand, and in direct opposition to this result, we find that the sanitary law of prevention which enforces the removal of those causes of loss, evolves the healthy body and healthy mind, and that marvelous power of the will over not only the insane impulse but over all those other disordered impulses which come from deficient self-control. Up to the acceptance of this law, and to the obedience of its requirements, the people must be educated;

* Gen. Oliver's Report to the Massachusetts Board of Education.

thus making the necessary education of the race the successful antagonist of its deterioration. This is the application of the well-known Oriental legend, of the contention between Ebony and Topaz—the evil and good Genii—for the soul of the young Prince.

So long as we allow unsanitary conditions within and about dwelling-houses, so to dwarf the physical as well as the mental and moral power of the child as to prevent the best development of adults; so long as we suffer diphtheria, scarlet fever, etc., to kill the child, consumption the young man and woman, typhoid the working-man, and other alike preventable diseases to do their evil work upon the ignorantly exposed sufferer; so long as we keep the death-rate as (ignorantly or not) we do keep it, above the possible 15 or even 17 to the 1,000, then is our professed Christian civilization deplorably incomplete, and our individual duty as Christian men and women far short of the demands of the second great commandment of the Divine Law.

Dr. Farr says that civilization is to man what domestication is to the inferior animal, and that both "history and analogy justify us in believing that the higher race admits of development by some of the same means found efficacious in the lower." In man, this is accomplished by a hygienic regimen, complete from infancy and in successive generations, and consequently a gradually increasing development in each, but with a geometrical progression and ultimate attainment which, if immediate, would be wonderful.

In the solution of these hygienic problems, it is sought as far as possible to free the people, for example, from those especial enemies of the human race—hereditary disease, hereditary pauperism, and hereditary criminality; to make Consumption, the Tramp, and the Jukes family (fair exponents of these three preventable evils), no longer, as at present, the natural entail of existing circumstances; to develop in the masses, beginning with the children, not only the moral, religious, and intellectual elements, but especially that athletic power upon which alone the best whole can be built, and which in an age when all educational means were at the lowest ebb gave the world the most splendid specimens of manliness. To accomplish the great revolution in society imperfectly outlined in these pages, we must have the aid of a higher power than those simply of interested association and organization. In the solution, therefore, of this vital problem of the future of the race, and

its nearer approach to the possible ideal revealed to us, there is a Divine factor, without whose help all our work will be in vain, but to whose promises, fulfilled in the past and awaiting our acceptance in the future, we may safely look for all needed help in the coming battle for the right before us.

The statistical investigations, especially of the English Parliamentary Commissions, have been made with such care and thoroughness that their results are universally accepted as very close approximations to the exact relations between health and disease. Some of these may well claim our gravest attention:—

It is shown that in London, which is known to be one of the healthiest cities in the world, there is annually an excess of 20,000 deaths, and, in the United Kingdom, of not less than 120,000 deaths, all from causes clearly ascertained to be preventable, and that the serious cases of sickness as clearly preventable are more than tenfold that number!

Considered as the producers of profit, men are really investments of capital, and as health is the capital of the laboring man, consequently every day of disabling sickness, and every death, is a money-loss. Dr. Farr, in the Report of the Registrar-General, says "that the minimum value of the population of the United Kingdom, men, women, and children, is, upon an average, not less than £159 ($795) a head. That is the inherent value of them as a productive money-earning race," thus making the loss caused by the 120,000 preventable deaths to amount annually to £19,000,000 (or $95,000,000). It is also demonstrated that, in addition to the fearful infantile mortality both in city and country, especially in the former, there is annually a preventable excess of 50,000 deaths, in England and Wales, during the school period of life!

In considering sickness as a most important element of loss, we must again look to the English Parliamentary Papers. In Great Britain there are many organizations under various forms and names, as "Benefit Club," "Friendly Societies," etc., which are practically Health Insurance Companies, embracing many hundreds of thousands of members of all ages. These Societies sustain themselves and make certain weekly payments to their sick and disabled members, by weekly or monthly contributions from each member. The accounts of their Treasurers take note of the time, duration, and character of each case, and thus a "full record is made of all the sickness and injuries of a very large portion of the men,

women, and children in every part and in all the employments of the Kingdom." Dr. Jarvis states that "the government, wishing to measure the productive power of the people, gathered these records, made through many years, and placed them in the hands of the best investigators and calculators to analyze and combine them, and to show the proportion and amount of sickness that fell on male and female children and adults of every age, and in the various occupations and conditions of society. These data thus carefully and accurately gathered, showed that for every death there were two persons constantly sick; that is, for every death there were 730 (365×2) days of sickness and disability."*

The same close observations and calculations will give, also, the average value of the product and labor of each individual for the day and year. The loss by each death being given, that of each day of sickness or disability can be very nearly approached, and it is one-third of all these losses that Sanitary Science claims to have demonstrated its power to save.

Life has been compared to a line between two points—that of birth, the point of origin, that of death, the point of termination—the length of the line between being an uncertain quantity under a secret and inexorable law, over which we were ignorantly supposed to have little or no control. The history of the human race has ever testified to the incessant craving of the heart that "our days may be prolonged in the land." The Science of Preventive Medicine justifies this innate desire by demonstrating that it possesses the power to give a longer extension and a more definite and certain quantity to this line of life. We are told that "the days of our years are three score years and ten," and if we are deprived of the "residue of our years,"

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* As the nation's wealth consists of the sums of all the estates within its border, the great and the small, deducting all incumbrances, mortgages, debts, etc., so the strength of the State is the sum of all the effective people, deducting all the personal incumbrances—sicknesses, disabilities, and imperfections. . . . All additions to the physical, moral, or intellectual power of individuals are additions to the energy and productive force and wisdom of the State; and, on the contrary, all deductions from these forces, whether of body or of mind; every sickness, every injury or disability, every impairment of energy, every clouding of the brain from intoxication, etc., take so much from the force of the body-politic. Collective personal gain is public gain, and aggregate personal loss is to the same extent the suffering of the community.—*Dr. Jarvis on Political Economy of Health.*

and do so generally fall far short of that attainment, it will be well for us more carefully to regard that wonderfully-true and perfect sanitary code given to the Jewish nation and recorded for our instruction and guidance in the Holy Scriptures, and remember that through their obedience to those hygienic laws, "He increased the people greatly, and made them stronger than their enemies," and when He brought them forth out of the land of Egypt, "there was not *one* feeble person among their tribes."

Mr. Edwin Chadwick, in his Address on Health, before the British Science Association, 1877, gives a summary of the chief results obtained in the progress of sanitation in Great Britain; and I can do no better than to quote what is especially applicable to our present needs. He says:

1. That we have gained the power of reducing the sickness and death-rates in most old cities by at least one-third; or, as a rule, of reducing the death-rates in old British urban districts to 16 or 17 in 1,000.

2. That in new districts, on sites apart from old urban sites, we may, with a complete arterial system of water-supply and surface-cleansing—including measures for the prevention of over-crowding—insure reduction of death-rates to less than one-half, or to a mean rate of 10 to 1,000, and the sickness in like proportion.

3. That in well provided and well regulated institutions for children from three to fifteen years of age, we may secure them an immunity from the common children's epidemics, and reduce the death-rates to a mean of 3 in 1,000, or to less by two-thirds of the death-rates prevalent among children of those ages in the general population.

4. That in prisons and places under effective sanitary control, the death-rates (from disease) have been reduced amongst persons from the school ages and upwards to about 3 in 1,000, or to one-third of the death-rates prevalent amongst the general population of the same ages.

5. That to the persons in such institutions immunity may be given as against all ordinary epidemics, typhus, and the eruptive diseases, diarrhœa, and dysentery, which ravage the general population.

6. That amongst the general population, a reduction by full one-half of the diseases of the respiratory organs may be effected by general public sanitation.

He says also that the possibility of all this admits of more abundant proof than he has been able to present in that address; that what has been done has been under conditions that admit of more complete and efficient repetition; and adds, it fully justifies the following recent and most important declaration of the Prime Minister of Great Britain, made in a public address in June, 1877: "I have touched upon the health of the people, and I know there are many who look upon that as an amiable but merely philanthropic subject to dwell upon; but the truth is, that the question is much deeper than it appears upon the surface. The health of the people is really the foundation upon which all their happiness and their power as a state depend. It is quite possible for a kingdom to be inhabited by an able, active population; you may have skillful manufacturers, and you may have a productive agriculture; the arts may flourish, architecture may cover your land with temples and palaces; you may have even material power to defend and support all these acquisitions; you may have arms of precision, and fleets of torpedoes; but if the population of that country is stationary or yearly diminishing; if, while it diminishes in number, it diminishes also in stature and strength, that country is ultimately doomed. And, speaking to those who, I hope, are not ashamed to say that they are proud of the empire to which they belong, and which their ancestors created, I recommend to them by all the means in their power to assist the movement that is now prevalent in the country, for improving the condition of the people by ameliorating the dwellings in which they live. The health of the people is, in my opinion, therefore, the first duty of a statesman."

Mr. Chadwick adds: "Sanitary science has had for its first stage simple ignorance and apathy; next, its stage of empiricism and half-knowledge, in which stage it is very much at present; with the common result of expensive, misfitting, inefficient, and wasteful work; with water distribution which makes good supplies bad, and bad supplies worse; with water carried into houses without the means of removing fouled and waste water, aggravating the evils of damp and of excrement-sodden sites; sewers without adjustment to the house drains; intended arteries without relation to the capillaries of the system, leaving undiminished death-rates, serving to encourage the sinister objection that sanitation is of no avail; and lastly, it has the stage of science, of complete knowledge, of unity, efficiency, and economy, tested by reduced death-rates."

We may well have most sanguine hopes of the future when we reflect that sanitary reform practically is a question of not a quarter of a century old; that the earnest and widespread thoughtfulness upon its necessity and value is far more than a temporary excitement; and as an eminent sanitarian has said, that during this last period, short as it is, more practical work has been done to crush out and prevent disease, and more valuable papers written illustrative of public hygiene, the world over, than since the Christian era began.

The object of this paper is to give such a compendium of State preventive medicine as shall best present to the people its claims upon their confidence and support, and to show, not alone by my own observation and experience, but by the reliable evidence of the highest authorities, what it has done, what it can do, and what the highest public good demands. In support of the argument, I have made free use of Reports, foreign and domestic, and other valuable documentary evidence, not generally accessible.

POLLUTION OF STREAMS.

By Prof. William H. Brewer,

Sheffield Scientific School, December 17, 1878.

Scientific investigation gives us each year more light and new facts relating to the influence of the waters of a place or region on its healthfulness. Year by year our knowledge increases of the amount of sickness and death caused in some way by impure water, either through its use as drinking-water or through the effect of its exhalations polluting the air we breathe.

It has been proved beyond any shadow of doubt that many diseases are spread by or through drinking-water. In several rather recent epidemics which may rank as pestilences because of their destructiveness to human life, we have certain proof that this was the medium through which the disease spread. The subject is important to the dwellers in city and country alike, and when better understood, the annual percentage of deaths in this State will be sensibly less.

There is probably not a health board in the whole world which does not find that practically, and in fact, one of the most common problems it has to deal with is the contamination of water in some way so that the health of persons is affected or imperiled, and which does not see numerous cases where disease and death are traceable to this source, either directly or indirectly.

The protection of waters, public and private, from such pollution as affects health, is no new matter; the problem of how best to do it is as old as civilization, if not indeed as old as the race. What modern science has done has been to bring out more vividly its importance, to show more definitely what the pollution is, its nature, action, and source, and to suggest remedies. The interests involved are so varied, affecting important industries as well as the health, and the necessities of getting rid of the sewage of towns, often making one community suffer that the other may be bene-

fited, and other considerations so complicate the problem that no one line of investigation can solve all the questions that arise.

When chosen by this Board to consider the subject of "Pollution of Streams and Water Supply" in this State, I accepted with a realizing sense of the responsibility involved. I believe that what is done should begin with a better knowledge of our local conditions and local problems, rather than those general considerations which form the elementary ground-work of all work on this subject. The fragment of year I have had has been too small to allow more than the beginning of investigations, the results of which must be left for another year's report.

One function of any health board is to instruct the public in the elementary principles of public sanitation; but I am not clear in my mind how far it is advisable to attempt this through the annual reports which by law are restricted to a thousand copies. The public press is unquestionably the means by which the whole public can be most effectually reached, and it seems important that through this medium the subject of water pollution and its relations to disease should be often brought before the public.

THE

REGISTRATION OF VITAL STATISTICS

IN

CONNECTICUT.

BY

PROF. C. A. LINDSLEY, M.D.,

NEW HAVEN.

MEDICAL DEPARTMENT, YALE COLLEGE, DECEMBER, 1878.

REGISTRATION.

It is one of the remarkable illustrations of real progress in modern times, that up to a very recent date, in the history of civilized mankind, no visible efforts whatever were made to ascertain the number of births and deaths within a given period, or the actual population of any political organization or state. It seems surprising to us that the cultured Greeks and the practical Romans should have overlooked the great importance and the political relations of these matters. After the decline of the Greek and Roman civilization, it is quite intelligible, however, that they should be neglected through the dark period of the middle ages. Doubtless after the reviving influences of the Christian era, the subject would have received much earlier attention had not a theological element interfered and retarded any early efforts to obtain statistical information respecting the condition of the people. As in the time of Galileo, misinterpretation of the Holy Scriptures barred the progress of astronomical investigation; so for long after, certain words* of the Bible were understood to imply that any attempt to number the people was contrary to the Divine will, and would provoke the resentment of God.

It has been only in quite recent times that any have been bold enough to declare that it is not sinful to "number" the people, but a positive duty of those to whom the interests of the people are entrusted, not only to number them, but also to obtain as much other information bearing upon their physical condition as is convenient, in order that it may be best known how to promote the people's welfare.

To England, more than any other country, belongs the honor of

*1 Chron., xxi: 1. "And Satan stood up against Israel, and provoked David to number Israel." Seventh verse: "And God was displeased with this thing; therefore he smote Israel." And again, chap. xxvii., 24th verse: "Joab the son of Zeruiah began to number, but he finished not, because there fell wrath for it against Israel."

establishing the foundation upon which is based the most successful system of the registration of births, marriages, and deaths. Whatever of the character of science belongs to the study of vital statistics, is due, in great part, to the persevering earnestness and effectiveness with which the subject has been pursued in that country.

It is the policy of the English government, when it has determined upon an important undertaking in any department of the civil service, to address itself to the execution of it by applying to it at once the means and the men which are best adapted to carry it to a successful issue. The conservative nature of their government, and their long experience, have established settled maxims and rules of legislation, by which, as a matter of course, the men for official trusts are chosen with an intelligent discrimination respecting their fitness for the duties to be imposed upon them. And they in turn, confident of the positions to which they are appointed, and not subject annually to the fickle caprices of a popular election, give their attention to the fulfilment of their trusts, as to a permanent pursuit, from which they are not liable to be ejected at the next turn of the political crank. And so they devote themselves to discharge the duties of their office with the enthusiasm and zeal arising from personal interests.

In this special branch of the civil service in England, a most remarkable progress has been made ; and it is largely through the special efforts of its officers. By their own personal influence, and by their writings and addresses, diffusing the knowledge which they acquire among the people, England has advanced beyond all other countries, both in legislation respecting the vital statistics, and in their practical results. But under our government, "the best government the sun ever shone upon," the circumstances are vastly different. The uncertain tenure of office, the character of the officials, who so often hold their positions as a reward for party service rather than because of fitness for their duties, have, with other things, almost wholly divested this service of any feeling of interest or zeal in its performance. So it has too often happened that the registrars of births, marriages, and deaths have performed their duties in a perfunctory manner—indifferent to, and perhaps even ignorant of, the magnitude of the interests entrusted to them. Neglect on the part of officials has been contagious, and seriously affected those whose duty it is to furnish the registrars the facts for record. It is the lamentable truth that in almost every town in the

State, disregard of the requirements of the law, both by physicians and clergymen, is so common as to excite no attention. Even mutual agreements are often arranged between them and the registrars, by which the methods of the law are ignored and their own adopted instead. Indeed, there are many physicians and some clergymen who wholly neglect, under any methods, to render to the registrars certificates of births, marriages, and deaths.

Public Sentiment—A Force, to be Cultivated and Utilized.

The great governing power in our times is public sentiment. Legislation is an apt and ready means of carrying into effect and making practical public sentiment. But legislation opposed to public sentiment is inert, inoperative, and almost a blank.

Not only in Connecticut, but everywhere, the prominent hindrance to exact registration of vital statistics which has been encountered, is, public indifference. The people are not informed of the importance of the subject, and do not appreciate its value. The recording and preserving a few facts concerning the birth, marriage, and death of the individuals of a community does not impress the common mind with any ready appreciation of its utility. The scant attention that it occasionally attracts among the people too often only provokes the half scornful and wholly uninterested question, "What's the use of it all?" The average American citizen is eminently practical, and his never-to-be-surrendered love of liberty will not tolerate any new restrictions upon his personal actions, or the imposition of any new social duties, unless they commend themselves to his approbation by their practical utility, and their promise of results productive of personal advantage. The first most desirable thing, therefore, to bring about is the education of the said American to the just appreciation of the value of vital statistics. He must be taught to "see the use" of them. Just as soon as a fair majority of the people can be made to understand that the collection and full registration of the few particulars relating to the three great events in a human life, viz., the birth, marriage, and death, may be made the source of information which is essential to their physical and social happiness, health, and prosperity, then may success be expected. We can rely with confidence upon the expectation that our citizens are sufficiently endowed with the selfish principles of human nature to look out for their own interest when the certainty of that interest once is made plain to them.

The Advantages of Registration of Vital Statistics.

They may be enumerated chiefly under three heads:

1. As affording a reliable record of certain events, which are often essential to be proved in establishing the rights to, or the just distribution of, property, and also as aiding by its inquisitive requirements in the detection of crime.

2. As determining the condition of the people in their social relations, and the influences which control the gradations in society, their habits and practices, and their social trend.

3. As ascertaining the sickness and mortality, with reference to the causes, and the comparative prevalence in localities, and the death rate. A fuller consideration of these points may not be unprofitable.

The Value of such Records, as Evidence, in the Protection of Individual Rights.

The vicissitudes of life are so frequent and inevitable that it is impossible to predict with certainty who of our immediate neighbors may be, in the near future, raised from poverty to affluence, or reduced from the enjoyment of luxuriant abundance to pauperism. In all the rapid and varied changes among individuals in their social relations, constantly going on about us, so much depends upon the exact facts relating to the births, marriages, and deaths of persons, regarding titles to property, and other civil and legal rights, that to a reflective mind no doubt can exist of the great value of exact registration of these three signal epochs in the life of individuals.

The accurate registration of the birth, marriage, and death of each individual is an obligation due alike from the citizen to the State, and from the State to the individual inhabitants, which ought not to require discussion, but which should be accepted as an admitted truth almost self-evident.

How often have persons failed of securing their rightful claims to property because of the broken link in the lawful evidence which such accurate registration would have infallibly supplied!

The frequency with which the registration of these events in Connecticut are called into requisition in the settlement of disputed claims is sufficient evidence of their value. The writer is not aware that any registrars have kept note of such calls upon their records, but can only state, from personal knowledge of facts in New Haven,

that they are often the source of reliable and important information that was not otherwise attainable.

The Report for 1870 of the Board of Health of New York city, speaking of this matter, says: "There are constant applications for transcripts from the Records. These transcripts are not only used in this country, but are sent to almost all parts of the world, where they are employed as evidence in legal claims.

"On account of its great legal value, the most progressive and intelligent nations of Europe have adopted this system of registration which is highly esteemed by their citizens, as it contains a concise biography of persons holding the highest as well as the most menial positions in the land. Some idea of the value of such registration may be gained by the fact that from June 1st to Dec. 31st (seven months) there were issued from the Bureau of Registration in New York, to applicants who considered them indispensable to accomplish the purpose for which they were needed:

Transcripts from the Records of Deaths, - -	773
Transcripts from the Records of Marriages, -	157
Transcripts from the Records of Births, - -	76
Total number issued, - - - -	1,006"

In New York, the records of births and marriages are very incomplete as compared with the death records, which, in part at least, accounts for the fewer number of transcripts, the incompleteness of birth and marriage records not affording the information often sought for. These facts illustrate not only the great necessity of complete and full records, but also the still greater importance of entire accuracy as to statement, because inaccurate or erroneous records might be the means of a deprivation of property, inheritance, identity, or social standing.

If it were practicable to secure the prompt registration of the immediate facts connected with the three most important epochs in every human life, it would be the source of information not only of present, but often of far greater future value. Every birth, marriage, or death which takes place exerts an influence which concerns the interest of many others, perhaps not yours or mine now, but may sometime concern even our welfare. The complete registration of such facts, for an extended period of time, and concerning large communities, would afford a basis for generalizations, and the recognition of natural laws, productive of the most valuable

results. The practical application of such a storehouse of facts are not limited to a single field of utility, but will be witnessed alike in their hygienic, social, and economic uses.

A Means of Detecting Crime.

Prompt and accurate registration of these events would be a direct, and frequently an effectual means of detecting crime, and indirectly of preventing it, in no small degree. Its relations to the crime of infanticide—to the practice of criminal abortions, to the detection of the frequent fatal results of quackery, and even in some cases of willful murder, will suggest themselves to any intelligent mind.

Within the past year, in New Haven, an inhuman father was brought to justice for the criminal abuse of a young child, through the agency of the certificate of death. The child died; and by the local law of New Haven, it could not be buried until a permit was obtained from the Registrar, after presentation of the certificate of death. The marks of violence upon the child were so conspicuous, that the physician gave as the cause of death, "bodily injuries inflicted by the father."

The Registrar would not give a permit for burial on such certificate, and reported the case to the coroner. The guilty party was arrested and indicted, and is now in jail awaiting trial for murder in the second degree.

If the practice followed in some of the other towns in Connecticut had prevailed in New Haven, viz.: to bury the dead without hindrance, and let an undertaker or some one else give a certificate at the end of the year, the criminal would never have been publicly exposed or punished. Other similar instances might be adduced as occurring in New Haven, not infrequently. Such facts illustrate in the most satisfactory manner one of the uses of requiring "permits" for burial.

A Means of Studying the Influences which Govern the Social Relations and the Gradations of Society.

The registration of Vital Statistics possesses a public and permanent value far exceeding any individual and temporary importance, in solving many questions respecting the social condition of communities, and the progressive changes in the habits and practices of peoples. Its direct bearing upon the relative prevalence

and causes of prosperity or pauperism—of high intelligence and morality, or of vice, intemperance, and degrading pursuits,—of vigorous physical development, or of feeble, low vitalized, and unsymmetrical bodily organizations, is all too obvious to require comment or illustration.

An accurate and extended registration of the great facts included in the expression, "vital statistics," would be invaluable in discovering those influences which affect society unfavorably, and not less valuable to guide and direct our efforts for the correction of such unfavorable social conditions.

It is not foreign to this branch of the subject to allude to the value of these accumulated and systematized facts, in their bearing upon the most important questions concerned in the business of life insurance and life annuity companies, in which the interests of so many families in every community are concerned. But an allusion merely to the obvious relation of vital statistics to the bases upon which these great businesses are conducted must suffice. The subject is too extended to discuss fully in this paper.

Registration in its Relations to Sickness and the Death Rate.

The third point under which the advantage of registration may be considered is, as a means of ascertaining the amount of sickness and mortality, with special reference to the causes—the comparative prevalence in localities, and the *death rate.* We all know, in a general way, something about these things. Some localities have a reputation for salubrity—others for unhealthfulness. We regard some places and circumstances as dangerous to infantile life, and others as favorable. Some places and occupations are more hostile than others to the health and lives of adults, while we recognize local influences to be favorable or otherwise to the aged, and again, in some towns and regions, one or more diseases or classes of disease are readily developed, and their progress is rapid and fatal; while in other places the same diseases do not occur, or are manageable and safe. So, too, we know that chronic diseases of various kinds are hastened or retarded in their course by the hygienic condition of different places.

These facts, and many others like them, are already known, as matters of common reputation, but our knowledge is too general and vague for practical use. What is required is, to make it definite and exact. To know by positive data how much the rep-

utation of a given place is due to the exaggerations of Madam Rumor, prompted by the suggestions of private interests, and how much is based upon precise estimates of the healthfulness of actual residents. We must, in some sort, take the dimensions of this kind of knowledge by such means as are practicable and reliable, and estimate its true value by arithmetical computation.

No better means have yet been found than by the careful and complete registration of the causes of death, in reference to whole populations. An incomplete or inaccurate registry is always misleading and deceptive. So, too, if the registry is only partial as regards extent of territory, if full and exact in some places, and defective or wanting in others, the study of comparative salubrity is defeated.

It is an accepted fact that local influences differ much in different places and seasons. One of the grand objects of registration is to discover these influences, their differences and their results, as well as the means of controlling them. Hence registration, to be most useful, should be *general*, *full*, and *accurate*. When it is so, surprising results are sometimes obtained. Thus, in a registration report of Massachusetts, it is stated that in Suffolk County the average duration of life is only twenty years (discarding fractions), while in Hampshire and in Duke Counties, it is forty years. From the English reports on registration, we learn that a child has a chance of living forty-five years in Surrey, but only twenty-five in Liverpool.

By this system of registration, and by no other yet devised, can the life line for distinct communities be so definitely drawn. A few years ago, it was officially stated that the average duration of life in London was twenty-seven years, in Liverpool but twenty; while it was forty years in Geneva, Switzerland, and forty-one for the people of Plymouth, Massachusetts. The indications it affords of unsanitary localities are scarcely less definite, and enable the public hygienist to designate with unerring certainty, the places where pestilential disease will be first developed, and rage with greatest destruction. Shall not such facts as these arrest the attention of legislators, and give more significance to the ready question—"*what is the use of it.*"

"Diseases are more easily prevented than cured, and the first step to their prevention is the discovery of their exciting causes." Says Dr. Hobbins, of Madison, Wisconsin, "registration teaches us every day, that which every day should be brought to our

knowledge, that we may and do, in a large measure, weave the web of our own life. That death being, for the most part, the result of influences by which we are surrounded. We have it greatly in our own power to make those influences conducive to life, or to our destruction. Our habits either make or mar us. Our eating, our drinking, our clothing, our personal cleanliness, our school-rooms, our church buildings, and even our legislative halls; the air and situation of our houses, our houses in their construction, material arrangement for heating, lighting, and ventilation—their very newness; our occupation, our education, etc.; all alike have an influence for good or for evil, and all alike come strictly within the province, within the legitimate consideration of the vital statistician."

The arguments and illustrations which might be presented, setting forth the value of systematic and thorough registration of vital statistics, are inexhaustible, and might fill volumes; but the above are sufficiently suggestive to convince intelligent minds that the interests of the people of Connecticut are involved in the successful execution of the registration laws in many ways, which most deeply concern their wealth as well as their health.

The Practical Workings of our Registration Laws.

More than a quarter of a century ago the Legislature of Connecticut appreciated how intimately the interests of the people were associated with the registration of vital statistics, and in 1852 repealed the old laws pertaining to the subject, and enacted new ones with fuller and more definite requirements. These have from time to time been modified and amended, with a view to more satisfactory results. As they stand upon the statutes to-day they are both in letter and spirit in most respects adequate to the purposes designed. But a practical difficulty has always been experienced in obtaining a ready and full compliance with them, by those upon whom are imposed the duties of giving the information to be registered. The imperfect, and in some respects valueless results, are not so much because the laws are defective in their requirements, as because the laws are not generally obeyed, and it is not made the positive duty of any officer to enforce them. Besides the registrars appointed in each town to keep the records, the duties required by the laws fall chiefly upon the members of the medical and clerical professions—who, of all men in communities, are sup-

posed to have, both by nature and education, preëminently the intelligence which would put the highest value upon this work. While it cannot be disputed that there are many individuals in the ranks of these professions who do so esteem the work, and to whose unrewarded labors its present advance is chiefly due, yet it is to be deplored that there are a great many in both professions who treat its requirements with a tardy and careless obedience in some cases, and in others with almost entire neglect; and the writer has reliable evidence that there is in many towns in the State one or more doctors, and sometimes a minister of the gospel, who defiantly refuse obedience, and make no reports for record. The essential features of the present laws on the registration of vital statistics are, that there shall be provided and distributed to all persons who are likely to need them, blank forms for the certificates of births, marriages, and deaths. That such persons, viz., clergymen, physicians, midwives, coroners, and all who may be officially acquainted with these events, shall fill out such certificates on every occasion, and return the same to the registrar of the town in which such event occurred during the first week of the month next succeeding; also, that the registrar in every town shall record the said certificates in books prepared and furnished for that purpose. The laws also provide that the registrars in their respective towns shall obtain the same information for record whenever a birth or death has happened for which no certificate has been returned.

It is quite clear that if these laws were fully complied with by all to whom they apply, the registration of vital statistics would be so nearly perfect that the deficiencies would be almost inappreciable. The facts, however, are that in many towns the laws are so much neglected that the records for some of the most important statistical uses are wholly worthless.

To ascertain as definitely as possible what is the practical working of the laws on registration throughout the State, I issued the following questions to every registrar in the State:

New Haven, September 14, 1878.

To the Registrar of Births, Marriages, and Deaths.

Dear Sir:

1*st Question.* Will you be kind enough to inform us whether the certificates of Births, Marriages, and Deaths in your town, returned to you, enable you to make your records complete and satisfactory?

2*d Question.* What proportion of the *causes of Death* are given by Physicians, and what by other persons?

3d Question. Are the returns made to you monthly, as the law requires? If not, when?

Please make any suggestions which you think would secure more accurate registration.

N. B. Answer questions by number; and you will greatly oblige if you will reply within one week.

Very respectfully yours,

C. A. LINDSLEY, M. D.,
Committee of State Board of Health.

There are 167 towns, and I have received answers more or less explicit from 131 of them. From 36 towns, among which is the capital, I have received no reply. To the first question—Do the certificates returned to you enable you to make your records complete? only 63 give an affirmative answer; and 68 towns say the records are not complete and satisfactory, although many registrars speak of their personal efforts to correct the deficiencies each year before making their annual report.

To the 2d Question—What proportion of the causes of death are given by physicians? the replies from 44 towns are, "all;" from 56 towns the replies are, "mostly," or a fraction above one-half; from 16 towns the answers are expressed in fractions from $\frac{1}{2}$ to $\frac{1}{100}$; from 7 towns the indefinite word "partly," is the reply; from 3 towns, "none" of the causes of death are given by physicians. In one of these, the registrar obtains the certificates by paid agents. In another, the school committee make all the certificates, annually. Fifteen respondents do not answer this question.

To the 3d Question—Are the returns made as the law requires, monthly? only 15 registrars answer in the affirmative. In 76 towns it has been the practice to make returns only once a year. In many of these the registrars speak of the difficulty, and often of the impossibility, of getting them from the doctors. From the remaining towns the general tenor of the replies is, that the returns are irregular. In many of these towns, some physicians and clergy are prompt and accurate, and others in the same town are negligent or refuse entirely. Several correspondents speak of the frequent omission to state *all* the particulars required in the certificates. This would be an inevitable result where the returns are made only once a year; especially if the facts had to be ascertained at that time, or were stated from memory. Even when the certificates are fully made, there might be a question of their accuracy, if written at a period so long after the occurrence. And it might

be a question, too, whether the value of the records, based upon certificates made many months after the events, and specifying so many particulars, is not entirely vitiated, as evidence in courts of justice, and thus one of the important objects of registration rendered null and void. Or is the danger greater, that if received as evidence, some error on record, by defect of memory, may defeat the ends of justice? In whatever way it is considered, there can by no valid reason for delaying the recording of events of such important consequence to individual and public interests until the facts which are to constitute the record are lost or rendered uncertain by lapse of time.

Some opinion can be formed of the results of registration in Connecticut, by a careful perusal of the following extracts from several of the correspondents who have replied to my circular. The selections are intended to exhibit the defects in the practical working of the system under the present laws. There is no arrangement of these extracts attempted, other than the alphabetical order of the towns from which they are sent. They might be more numerous, but I think they are sufficient to illustrate the facts.

Branford.—"Perhaps a more perfect registration of deaths would be had if a permit was required for every interment."

Bridgeport.—"I am very glad to get the returns by the middle of January of each year. In my opinion, the statute requiring permits to be issued by the Registrar before a body could be interred, should be reënacted—the time during which said act was in existence being the only period during which complete returns have been made by the doctors. The physicians here concur."

Clinton.—"I keep account of the deaths as they occur, and if no one hands in a certificate of death, I fill one out myself after inquiring into the case."

Colebrook.—"I have never received a certificate of birth or death from a physician in accordance with the law since I have held the office of Registrar. My records for last year I consider complete, but obtained by my own personal efforts and inquiries. The causes of death are almost entirely given by members of the family, or from my own personal knowledge."

Danbury.—"I have tried to have all the doctors report monthly, but do not succeed. I wish something could be addressed to them which would cause them to report as the law directs."

East Granby.—"I have every year except 1869 rode round the town about the 8th to the 10th of January after births and deaths. One doctor in Suffield, who has practised in this town for several years, has never

made a return to me. Last year I had to ride around town and get three-fourths of the deaths, with the best information I could about them ; and at my age—now nearly 72—it is not desirable business. Now for suggestions: A man that holds an office and does not feel proud of discharging the duties of it, and that, too, correctly every time, is not fit to hold an office. A doctor that does not feel proud of making full and correct returns of all births and deaths where he is employed, and that, too, as required by law, ought to be exposed to the public. Let the people look at him; let every Registrar in the State report to the State Board of Health the name of every physician that fails to make returns, and have the name published annually. A law imposing a fine would avail nothing, for it would not be enforced."

East Haddam.—"The returns are very incomplete; in fact many only examine the *lists of coffins* furnished by the undertaker, and get the name and age from him, and report nothing more. I would suggest that a law be passed to the effect that if the cause of death is not filled in, and other necessary information, no fee shall be paid the physician who makes the return. I think so long as the doctor gets his twenty-five cents he does not care for the trouble of doing his whole duty. Then if it could be that the State Board could prosecute, by themselves or by agents, any neglect of duty, instead of the Registrars, it would have a good effect. Registrars are generally near neighbors to the physicians, and in country towns prefer to let the office go rather than make enemies, especially if the delinquent is the family doctor."

East Lyme.—"About half the death certificates are made out and returned by the sexton."

Enfield.—"I have to depend upon the sextons for the cause of death in one-third the cases."

Farmington.—"With regard to births, the returns are well attended to; the names of children have been very much neglected; the fault lies more with parents than with doctors or midwives. The marriage certificates are generally returned by Protestant clergymen; the Catholic priests are careless, and some marriages by them are never certified to me. Death certificates are not fully returned by physicians. Our laws are good enough. Doctors seem to be very loth to make returns of deaths."

Groton.—"Physicians make no returns in this town. By vote of the town, the School Committee of each district make returns at the close of the year, when they enumerate the children; and I think too little interest is manifested in them to meet the demand."

Guilford.—"I have more trouble to secure the names of children, so as to make a perfect record, than anything else connected with it."

Glastonbury.—"Physicians, in case of death, generally call it something; whether it is right or wrong I don't know. The worst trouble is to find out where a person dies and no doctor attends them. Doctors are very careful not to return any more than they doctor."

Kent.—"We are within a mile or two of the State of New York, and

many births and deaths are attended by physicians over the line, who do not make any returns."

Litchfield.—"Marriages are fully reported, but only about two-thirds of the births and deaths get reported. Some of the doctors fail to send in their returns at all, notwithstanding much importunity by Town Clerk. Many cases of births are not attended by any physician, and do not get reported by any one."

Middlebury.—"A small proportion of the births and deaths occur without the attendance of any physician. These, of course, are troublesome to perfect, partly owing to the necessity of making special inquiries, and perhaps a journey, and partly from the lack of appreciation of the work on the part of the public. Town Agents hardly understand the necessity of the expense. I remember that the First Selectman, in speaking of my predecessor, said: 'He came into my neighborhood, two miles, to hunt up a case, just for the sake of a twenty-five cent fee!' If from haste or oversight the physician omits to take immediate notes, he hardly ever finds another good opportunity, and he either neglects it or he takes trouble enough to vex his generous soul."

Middlefield.—"After the certificates by physicians are in, I have usually sent a man to gather carefully the items of births and deaths in the town, and he furnishes say half the certificates, and ascertains causes as best he can."

Milford.—"What the physicians omit the sextons supply. We do not get more than ten per cent. of the given names on the birth certificates, and no provision is made for obtaining them subsequently."

Monroe.—"It is impossible to get the physicians to send in their returns, or the most of them. What shall I do if they do not make returns as the law requires?"

New Britain.—"Most of the births not reported are where the services of a midwife are employed, and it is almost impossible to know who are thus acting. I would suggest that all such be licensed, with a penalty for acting without, or that they be required to report their names to the Town Clerk or other proper officer under penalty for neglect."

Newington.—"The returns are one per cent. exactly, by physicians, the other ninety and nine I investigate."

New Milford.—"In the last ten years I have recorded 698 births in all, and there are only 108 that have a name on the record, and there are undoubtedly some births that are not returned. In the same time I have recorded 572 deaths in all, and one-third of them I took from the books of the undertaker, who informed me as to the cause of death as well as he could. About one-fourth of the one-third are recorded as unknown."

North Haven.—"Some of the physicians reside out of town. They are not particular to return their deaths at all, and some do not return births. I would suggest a law making it a penalty for a sexton to inter a body without a certificate from the Registrar, who in turn could not issue a permit without a certificate from a physician, except when no physician attended."

Norwalk. "Two-thirds of the certificates are by physicians, the rest by undertakers. I think we could get a better registration of deaths if the undertakers had to have a permit to bury."

Norwich. "The law passed requiring a permit to bury the dead was a good one. Then you was sure of getting every case of death, but the people were very much opposed to it in the country towns, and it was repealed. If the fees for a permit had been made payable by the town, I think perhaps there would have been less objection to it."

Oxford. "I verify and correct where I do not attend. If a case is returned by a 'Homœo.' as 'Inflammation of the Bowels' when the disease was Typhoid, I class it where it belongs."

Pomfret. "I have to make enquiries at times in all the districts to make my records perfect, and expect to have every birth and death on record. The cases where no returns come in are where there are no attending physicians. It is a Connecticutism that the laws are not put into every family, and so some of them don't know the law.

Roxbury. "I would suggest for the more accurate registration of births, the passage of a law fining the fathers of all unreturned Babies $5.00, and making it the duty of registrars to collect it for their own benefit."

Somers. "The great difficulty in this matter of registration arises from the heedless manner in which some physicians fill out the blank returns, seeming not to take the trouble to fill out more than about half of the blanks on the certificates. The name of the child born is oftener omitted than inserted. I have on my records of Births for the last twenty years, 300 without a name. What a splendid record this will be for those who wish to examine them, say seventy-five or a hundred years hence! What perplexity and vexation they would encounter! Now I have not the least doubt that this great neglect to return the name exists in every town in the State. The excuse of the physician is, when he makes a monthly return, that the child has not been named; this undoubtedly is true, but he has no ground for such excuse when he *returns by the year.* I am aware the law gives the registrar the right to perfect his records at any time. But is he going to spend his time going around to get the names of births to perfect the certificates of those who receive pay for them. He will not be willing to do it without compensation. Now if he should receive twenty-five cents or so, it would be an inducement to get the names."

Stratford.—"Think the law defective in regard to payment—the Selectmen should investigate as to return made once or twice a year, and *send* to the persons making such returns a town order for amount due. A *non-resident* physician will ordinarily spend more time running after the small amount due them than receipts will pay them for." "The borough of West Stratford adjoins Bridgeport, and Bridgeport physicians practice there almost exclusively. I get not more than $\frac{50}{100}$ of their cases, which makes a defective record for about one-third of the town."

Sherman. "The certificates are returned just as it happens."

South Britain. "The returns are mostly made when I solicit them. The only trouble is, the doctors are careless in the matter, and the records would be very imperfect if the Registrar did not attend to the matter."

Southington. "The physicians here are all very delinquent about getting in their returns."

Suffield. "In looking up genealogies I find that the record of some families are very imperfect, owing to the fact that they employ physicians out of town, and those physicians are not particular in making their returns out of their own towns."

Stonington. "In the first of January I have to devote a week, and go all over the town after the certificates, and if I get the returns in without going after them more than once, I am lucky."

Thompson. Possibly one-fourth of the causes of death are given by physicians. The Catholic Priest returns one-half of the whole. I would suggest a specific law, that towns should not pay for the certificates unless returns are made on time.

Torrington. "I am unable to make my record complete or at all satisfactory from returns of physicians. The returns are so incomplete that in January of each year I have been compelled to employ a man to canvass the town, and procure information as to births and deaths of the preceding year. I pay him twenty-five cents for each certificate, being the legal fee allowed to physicians. One physician in town I can hardly induce to make any returns at all, and those he does make are grossly defective. I find it impossible to get any returns at all from physicians residing out of the town, who have officiated at births or deaths here." "It is very evident to my mind that the system of registration required by our statutes, however good in theory, is fatally defective in practice as far as entire accuracy is concerned."

Warehouse Point. "I think more accurate returns would be secured if no fees were allowed upon certificates which are incomplete."

Waterford. "Am not able to make my records complete or satisfactory. I receive no returns monthly. I receive them only once a year, about the first of January. The most I get, I *find out by the column of deaths in the paper,* and what I know at the time of their death."

Watertown. "If means could be devised to obtain the names of children it would be a great improvement. For instance (as is possible) a father has three sons born in three successive years. When wishing to prove the age of Tom, or John, or Jim, years hence, and no names given, who can tell which is which? Physicians should be compelled (if possible) to obtain the names of infants. Now we do not get five from one hundred births."

Weston. "Physicians who reside out of town, who sometimes have cases to attend here, do not trouble themselves to make returns to the registrar."

Windsor Locks. "To secure more accurate registration it would only be necessary to enforce the law to make the returns monthly."

Wolcott. "The records are not complete. There is scarce one single instance where the cause of death is given by a physician. The returns are made with no regularity; what is done is through my exertions."

The above statements and opinions from every part of the State, indicate clearly enough that the registration of vital statistics in Connecticut falls very far short of that completeness and accuracy which the laws upon the subject require, and aim to obtain. There is also revealed, through these correspondents, several defects in the laws, and certain positive hindrances to their successful operation, which it should be the object of further legislation to remove. It is gratifying to know that many of the Registrars, in their communications, have mentioned that since the State Board Health has issued a circular upon the subject, there has been a marked improvement in rendering the returns.

The very general failure to get a record of the names of new-born children, is a fault which demands a remedy. It is quite obvious, that under existing laws it will be impracticable for the physician to render to the Registrar the name of the child, on all his birth certificates, because so very few of them are named at the time when the law requires him to make the return. There would be some encouragement to prolong the time for returning them, to three or six months, but the testimony of my correspondents is, that the evil is not in the least abated, when the returns are made only at the end of the year, as is the general practice in seventy-six of the towns reporting to me, and to a considerable extent in many others. So that experience teaches that nothing would be gained by such a change in the law, and much would doubtless be lost by the inaccuracies and omissions in the certificates, from the attempt to state the facts so long after their occurrence. The present law, it is quite apparent, is not competent to the object—it is not adapted to the situation. It is a seeming attempt to make bricks without straw. Still, it is good so far as it goes. It should not be abolished, nor changed, only an additional provision is requisite to make it effective. Let the law continue as it is, requiring the physician to return his birth certificates monthly; because, during his professional attendance upon the mother, he can obtain all the information required by law, except the name, most easily and correctly. Then make it the duty of the Registrar to inquire personally, at a time not longer than three or six months after birth for the name of every infant born in the town for which he has the physician's certificate and upon which the name is wanting, and the Registrar shall receive for such service, and for completing the record, the sum of   cents, for each name so obtained and recorded, to be paid by the town.

The objection may be made that this will cost more. So it will, and so it should—for it involves more labor and time. The physician can not afford to do it, even for the additional fee—it is not professional work, and can be done by another as well as by him. It will pay the Registrar satisfactorily, for he will have all the babies in his town, and can do his work systematically, while each physician would have to spend a much greater time proportionally, upon the few that he has attended.

In regard to the death certificates, only one practicable method of securing them all, has yet been devised. That method is, by prohibiting the burial of the body of any deceased person without a written "permit" from the Registrar, which it shall be his duty to give, on reception of the legal certificate.

For each burial permit the Registrar shall receive a fee of cents, to be paid by the town, and shall make no charge for it to the applicant.

This has been the practice in New Haven (in compliance with a local town law), for several years. Excepting that the applicant for the burial permit pays a fee of twenty-five cents, instead of collecting the fee from the town, as for several reasons I think should be the law. It works easily and satisfactorily, and ensures complete returns for every death, and it will always be the Registrar's fault if he accepts certificates which are not properly filled out, as the law requires. It is very satisfactory to the physicians, because they are relieved of the duty of delivering their death certificates to the Registrar, and give them only on demand, to the friends of the deceased. Such a law, for a brief period, did prevail in the State, and was hastily repealed by the succeeding legislature, because it was represented to be difficult and troublesome, in the country towns, to procure the certificate and the permit before the funeral. And yet it would be entirely safe to say that one could not name a family in any country town that would not undertake five times the trouble, rather than forego the observance of the fashion of hanging a strip of black crape at the front door, while the body of the deceased friend lies in the house. Public sentiment, as I have already said, is far more potent in its tyrannical demands, than the laws which any legislature can exact.

While the laws on registration have not accomplished all that was expected, or all that they should have done, still experiencc fully justifies confidence in ultimate success. The undertaking is

not hopeless, and must not be abandoned. The laws are good, and with some amendments and better provisions for their enforcement, they will be found adequate to the purpose, in their requirements. In some places in the State they have worked easily and satisfactorily.

The laws are susceptible of such amendments, and improved provision for their easy execution as will make them adequate in their requirements, and effective.

The State cannot do otherwise than go on in the effort to improve and perfect them.

Every State, and every form of organized society, has duties to perform, which are as important and imperative as those of the individual. In our present civilization, one of the recognized duties of communities is to take note and make record of whatever pertains to growth and development, or perchance to opposite results. And it is the bounden duty of well-ordered government, "to establish such a system of registration of all vital statistics of any importance, as shall enable it, both for the present and the future, to know its own life-history, and the influences that are moulding it for better or for worse, as the years pass on."

ON

EPIDEMIC, ENDEMIC, AND CONTAGIOUS DISEASES.

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EPIDEMIC, ENDEMIC, AND CONTAGIOUS DISEASES.

The diseases that have prevailed extensively belonging to this class have been diphtheria, typhoid fever, diarrhœal diseases, typho-malarial fever, scarlet fever, about in the order named, and of the minor contagious diseases, mumps and whooping-cough.

The first extensive outbreak of disease that attracted attention was the epidemic of diarrhœal troubles in Hartford that followed the substitution of the river water for that from the reservoirs in West Hartford, in September. The onset was sudden, severe, and extensive, limited to the region supplied by river water, with no more than the ordinary number of diarrhœal cases common to the season in the portion not thus supplied, and in the State generally. The cases were marked by severe gastric pain, oftentimes vomiting, profuse diarrhœa, prostration, in many cases, and the recovery, when rapid, leaving an uneasy and painful condition of the bowels, lasting for weeks. In many cases the recovery was protracted, dysentery followed, and during October an unusual frequency of cases of typho-malarial and typhoid fever occurred at the proper time to have been thus caused, with a larger mortality in October from typhoid than has been reported for eighteen years, which was as far back as the records were examined. The sudden extensive and limited outbreak led to the suspicion of the water supply, as it is generally conceded that such outbreaks are due to contaminated water supply. Nearly every family in the affected district had one or more cases, and in many none escaped. The same was true of boarding-houses, where there were often from fifteen to twenty cases. Specimens of water were obtained and examined from the faucets, the reservoir of the pump-works, from the river over the inlet-pipe, and from the center of the stream, also from under a drive of logs above. That from the faucets was most impure, as it contained the sediment from the pipes stirred up by reversing the flow, which, with the other impurities, made an unsavory compound. This was very turbid, opaque at

ten inches, while good water should be clear at eighteen, and the sediment for the most part organic matter, diatoms, animalculæ, fungi, infusoriæ, and the like, indicating putrescible matter, closely resembling ditch water; decaying fragments of vegetable tissue, and even of muscular fibre, proved incontestably sewage contamination. The chlorides and nitrites were in excess, while the permanganate of potassa test showed large quantities of albuminoid ammonia, all of which indicated a water too foul for use. The water in the reservoir was not as bad, but differed only in degree; that taken directly from over the inlet-pipe at the pumping-works showed sewage contamination, while the water in the river was comparatively pure; that from under the logs was not much worse than from the center of the river. On examination it was seen that a large sewer opened but fifty feet below the main inlet-pipe. By the tide, which rises here eighteen inches, and by an eddy the sewage was set back directly over the inlet-pipe of the water-main, and so pumped up into the water drank. This sewer, where it discharged, was an open ditch, or rather the bed of a sluggish brook into which the ditches from the north meadows emptied with a slight fall, said ditches receiving considerable sewerage along their course. Two large sewers emptied near the outlet of this brook, thus making it a kind of a trunk sewer. Although this condition of affairs had existed, with the differences hereafter noted, for many years, it had never attracted attention, as the water from the river was used only when the supply from West Hartford threatened failure, epidemics of dysentery, diarrhœal diseases among children, and cerebro-spinal meningitis might, it would seem, have suggested something wrong, but nothing ever came of it. Our city fathers, generally, have not yet quite reached the plane of appreciation of preventive medicine, so that we have but one thoroughly organized local health board in the State, although matters are fairly under way in one or two of the cities, with a promise of good results. A pier of stones recently thrown out to protect the pipes helped form the eddy, also an extensive drive of logs for miles up the river. Moreover, the water in the reservoir of the pump-works had not been let out for three years, and river water had not been exclusively used in any portion of the city for that period of time; but when pumping was done, it had been directly into the pipes to reinforce the flow. There were, therefore, the stagnant water in the reservoir, the filth in the pipes, and the sewage pumped up, to contaminate

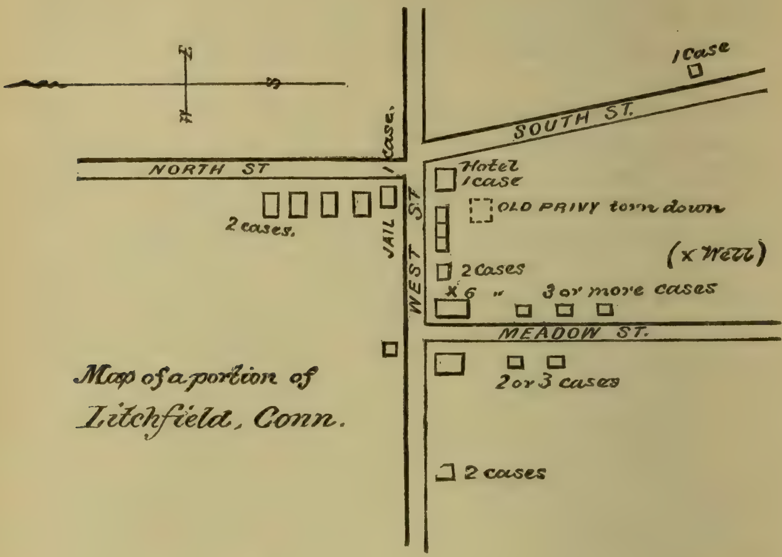
the quality of the water. The pumping was discontinued on remonstrance to the water commissioners, and the outlet of the sewer removed to a point below the eddy. The chairman of the city health board was enlisted in the matter, and rendered valuable assistance. It is to be hoped that a recourse to river water need never be again necessary, still it is a contingency likely to arise at any season.

The reason for escaping constant evils from this source was probably due to the dilution of the sewage when the pumps were heretofore partially relied upon, while many a case of diarrhœal or dysenteric disease might have had its origin in filth thus carried. However that may be, no one would willingly drink polluted water if he could help it. The fallacy that rivers to which sewage gains access purify themselves by flowing, has been productive of an ill-grounded sense of security. The readily oxidizable part of the sewage that gains access to a river is destroyed in the few first miles run, but the portion left is oxidizable with extreme slowness, and is only removed by vegetation or minute animal life, which latter increases in proportion as its food increases; hence water swarming with minute forms of animal life is foul, not because the animalcules, etc., are harmful necessarily in themselves, but the food which supports them is putrescible animal matter, always a source of danger; hence the microscope becomes a powerful ally in determining the sanitary purity of drinking water. These minute forms are not to be confounded with the larger forms of animal life visible to the eye, or under low powers, as these do not indicate any special impurity unless present in very large quantities, but the bacteriæ and allied forms are to be looked upon suspiciously.

Typhoid Fever.

Typhoid fever has been very prevalent in the State, in certain places, causing eighteen deaths in Hartford; its probable cause has been alluded to already. In Litchfield there were an unusual number of cases, apparently originating from contamination of soil and wells from filth which was allowed to saturate the soil beyond its power of purification. A vault used, for years, situated partially above ground on the summit of a hill, by changes in buildings was allowed to discharge by a shallow drain upon the slope of the hill. On this slope, ran a street, and here the fever commenced and raged most extensively. In the house where the

well was about fifty feet from this mass of filth there were six severe cases, and one or more cases in every family using water from that well.



The cases were for a long time confined to the side of the street nearest this drain; and cases in nearly, if not every house; later, there were cases on the other side of the street. In addition, an open ditch ran in front of these houses, and the filth from the jail deposited by a pail system on the surface was washed into this ditch to a great extent.

There were at first but few cases outside of the area thus implicated; but a disease that starts from local causes, though at first confined, soon gathers strength and invades quarters that would never have given origin to it. Thus unsanitary conditions and foul dens allowed to exist by sufferance, become a standing menace to the health of the whole community, by whose negligence or indifference they are tolerated. There is no place, however healthful its surroundings and situation, that may not suffer from a neglect of precaution in the disposal of filth, and long immunity only renders the evil more marked when it does come, as from accumulation and soil saturation, the causes for extensive trouble exist, and need only a little variation in the usual

order—like a very dry season, for instance—to render the threatened danger an actual one. Fortunately, in this climate the frequent rains relieve us from the effects of our carelessness often; but the longer a country is settled, and the waste incidental to occupancy, and a necessary consequence of living, accumulates, less and less confidence can be placed upon the soil around our dwellings, which after awhile becomes saturated, and no longer renders the filth it receives harmless; or an excessive quantity, beyond the powers of vegetation to absorb and re-convert, may be placed upon it, air and water, one or both, become contaminated, and disease results. The diagram shows the relation of the first cases to the focus of infection.*

TYPHOID FEVER IN THE GUILFORD BATTERY.

The battery went into camp September 9th, with forty men—twenty from Guilford and vicinity—messed with Co. E of the Third regiment. Of this twenty, fourteen have had typhoid fever; two have died, and many of the cases were severe and complicated. There were no other cases connected with these in any manner, although one of Company E's men was sick, but he was taken immediately on his return home. In the first place, Guilford was thoroughly investigated, and no cause found there. The cases were scattered, and there had been no preceding case of typhoid fever, nor have there been any others, except those among the battery men and in their families. During November there were eight cases quite severe in the families of two of the men, who had been very sick with typhoid fever, and some cases in one or two others. The outbreak of the disease, on an average about two weeks from the time they left camp, also served to decide the question, that infection had been received while in camp. The food was suspected, and exonerated. The men occupied half of each table, Co. E men the other, and food was passed up and down the tables. The milk supplied was used by the whole table and by other companies also. Many of those sick had not been off the camp-ground during the encampment, and therefore could not have received infection from food or drink taken elsewhere.

The disease must then have been received in camp. The loca-

* Some changes in the charter of Litchfield have been made by which powers are granted for drainage and sewerage, which were before lacking, so that all sanitary requirements are fully and completely met.

tion was excellent, the soil dry, naturally well drained, and no part used for tents where latrines had formerly been situated. The soil under the tents of the Guilford battery was very carefully examined, to exclude soil contamination. The latrines is use were well situated and well cared for during the encampment. In the rear of their mess-tent there was a stagnant pool of fresh water, with no natural outlet, receiving the drainage of the higher ground, where the latrines of a former encampment had been situated, and fed by an old spring about five feet deep, said to have been walled up by the Indians, and which had not been cleaned out for years.

On thrusting a stake down, it was found to be filled with a mass of putrescent vegetable matter, five feet deep, which gave forth volumes of offensive gas on stirring; its qualities and potencies needed no investigation. A specimen of water from the pool, however, was obtained and examined as to its sanitary, not chemical, qualities. Water is most vile and impure, in a sanitary sense, that contains organic matter in a putrescent or putrescible condition; and any water is considered usable for drinking that requires the addition of some such substance as sugar, and the maintenance of a temperature of 88 degrees at least for some days, in order to start fermentation; this specimen commenced to ferment on the third day, at ordinary temperature, and not in sunlight, and proceeded rapidly, giving off ill-smelling gases and developing the spores and rods which are associated with organic putrefaction, and which (or the fluid which nourishes them) are agents in inducing septic change or disease.

Now how were these men exposed to danger from this source? In the first place, this water was used to wash dishes and cooking utensils when the camp was first established, and probably vegetables at some time or other afterwards, and might have been used in making coffee, especially on the last day, when these twenty men ate separately, as they had to start earlier than the rest, or on the day of their arrival, when they ate separately. No amount of boiling will destroy the vegetable spores described above. They are indestructible at the temperature of boiling water.

This water when used was brought up in a large tin wash-boiler, which was either used to make coffee or boil vegetables—two were in use. The target-range for small arms for these men was across this pond, which brought them every day in its immediate vicinity, and to its very borders, and it is more than probable that some water was drank. As to *appearance*, the water was as good as that in the barrels supplied to the camp, and often clearer.

But, granting that the water could produce disease, why was it typhoid? This question is easily answered. There was a case of typhoid in camp among the attendants, who had a not very well marked illness, which developed into a severe case of typhoid fever; who entered camp with malaise, and diarrhœa soon developed, remained in or about the camp until the disease was fully decided, thus furnishing the specific virus of typhoid fever, without which, many claim, no case ever occurs.

The causes predisposing these men to receive infection, supposing them to have been equally exposed as the others in camp, were, in the first place, their age. They were younger men than Co. E, for example, ranging from 18 to 30, but seven over 30, while there were none in Company E under 21, and most over 25. The average age of those sick was 21; of the dead, 19. In the second place, the fatigue of the march of twenty-four miles, and the exposures of the camp, which are, as is well known, best borne by men from towns, who take better care of themselves than men from the farm, especially young men. There is something, too, in habit, and these boys were not as well fitted to resist as those whose lives were passed for the most part in unhealthier surrounding than any they were exposed to at Niantic.

Typho-Malarial Fever.

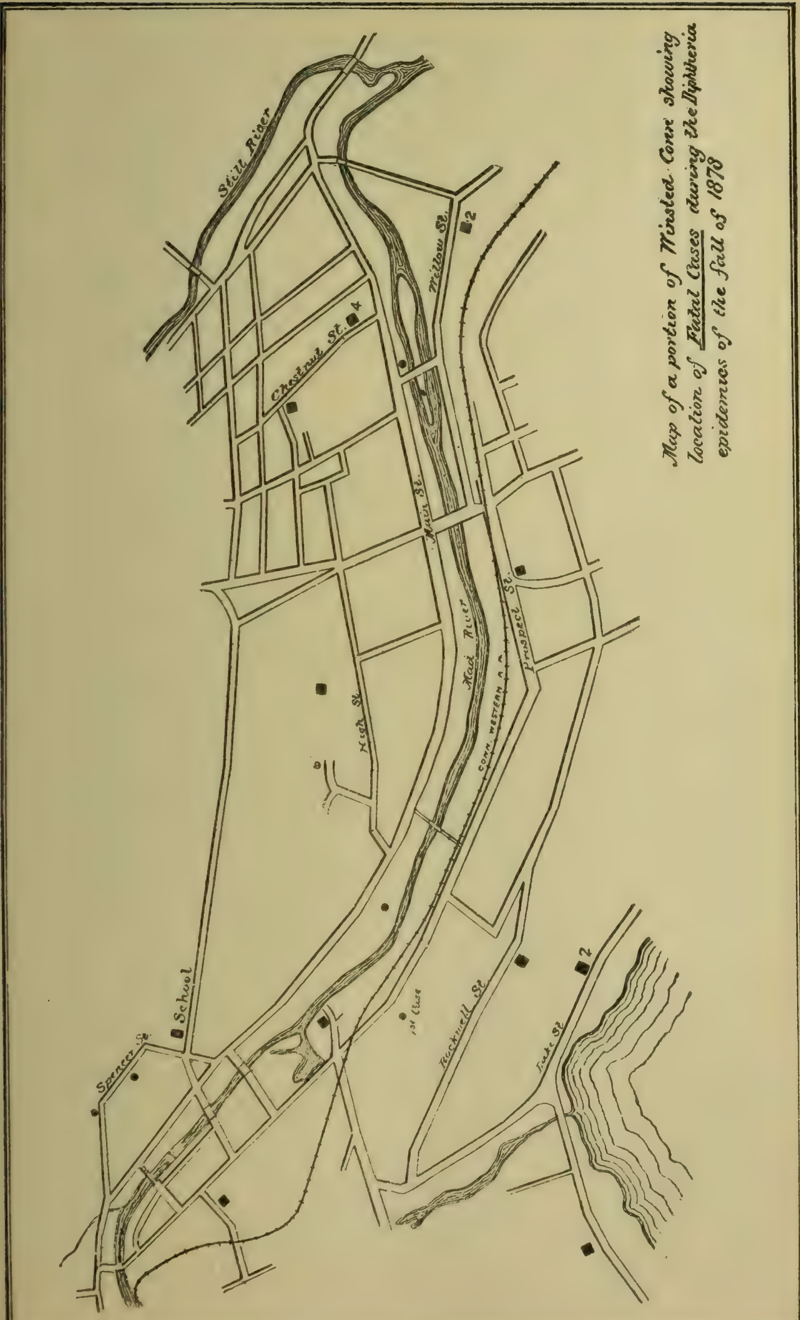
Typho-malarial fever, which first appears in the published mortality lists in 1877, has been quite frequent this year, though perhaps not epidemic, except in Hamden, and vicinity, where malarial fevers have attacked almost all the inhabitants of all ages, and have become endemic for several years. There were 12 deaths from typho-malarial this year in Hamden, and 9 in Derby. In Hartford, New Haven, Salisbury, and other places, it is reported as prevalent, and has been, judging from reports, more prevalent and over a wider area than last year. In Durham ten cases occurred near a large bush swamp of 50 acres, soon after it was drained. It is credited with 50 deaths against 28 last year, and has been more prevalent in New Haven and the southern portions of Fairfield counties. Malarial feveris reported as invading Norwich, Salisbury, Colchester, and some towns in Litchfield County, for the first time, that is, cases originating there.

Diphtheria.

Diphtheria has shown a marked tendency to take on an epidemic form, to recur with increased severity, and to be accompanied by a large number of diphtheroid cases more or less severe. Children have been usually attacked, and the mortality has been almost entirely confined to them. In some instances the disease has clearly been introduced from without, and spread from one case, finally breaking out into an epidemic; in other cases it has apparently been sporadic, and due entirely to local unsanitary conditions. The history of these epidemics in towns shows conclusively that the duty of systematic attempts to protect the well from contagion is not yet fully recognized, or acted upon, nor the importance of thorough sanitary precautions.

Winsted.—The disease was introduced, apparently, by a child upon its return from Massachusetts, where diphtheria had been prevalent, and was succeeded by several cases about a week after in the immediate vicinity. These were on high ground and clean surroundings, as reported. "The outbreak of the epidemic was simultaneous with an easterly storm extremely chilly and raw, producing an unusual feeling of depression. The time of the attack was about 10 or 12 days, after which sporadic cases occurred in badly drained houses, near stagnant pools, wet cellars, etc. The disease remained in this form for about two months, when, after another easterly storm, with a similarly depressing, chilly influence, another outburst of the disease as at first, attacking children who lived in dry, well-drained houses on elevated ground, and lasting for about 10 to 12 days and as suddenly subsiding. The disease has not been as malignant as it generally is, cases did not usually reach a fatal termination before the sixth to ninth day, and death occurred almost invariably from suffocation. Since the second outbreak there has been a very remarkable number of cases of spasmodic croup, all very tractable.

The borough of Winsted is about a mile and a half in length. The fatal cases have all been in the western portion of the town. A lively stream runs through the town from west to east, which receives the drainage from many houses. Both epidemics occurred in a tract a quarter by a half a mile, destroying in all seventeen children, average ages six to eight, and all but two under ten. This is the first fatal epidemic I have been called upon to contend with, during a residence of over thirty years. Usually



Map of a portion of Winsted Conn showing location of Fatal Cases during the Diphtheria epidemics of the fall of 1878

two or three deaths would be about the average fatality from scarlet fever and the like."—[Extract from letter of J. W. Bidwell, M.D.]

The above extract describes very graphically the epidemics in Winsted. The lingering of the disease where unsanitary conditions existed, and its marked tendency to recur, are noteworthy features. The effect of the easterly storms was no doubt depressing, as these are confessedly deleterious from their cold and chilling tendencies.

In the first epidemic there was but one fatal case in a house ; in the second there were more in several instances. On Chestnut street there were four fatal cases in one house. In the rear is a swamp hole with no means of drainage ; the sanitary surroundings in other respects were bad.

The accompanying map shows the location of the fatal cases ; a circle showing the first, a square the second, outbreak ; the numerals attached indicate the number of deaths where more than one occurred in a house. There were no fatal cases east of Chestnut street. The fatal cases only are marked : these were the centers about which the epidemic prevailed.

Norwich.—Diphtheria appeared first the last of July in a tenement house belonging to the "Falls Manufacturing Co." The first case was fatal. Within two weeks there were five cases in the same house, confined to two of the four tenements. For a week or two there were no new cases. It then broke out afresh in the next house on the same side of the street, and at about the same time in a house directly opposite, both tenement houses. There were fourteen cases and two deaths. An aunt of the last child who died attended the funeral on Monday, and was taken with diphtheria on the Thursday following. She lived in a single cottage half a mile from the tenement houses, in a healthy locality. But few other cases have occurred in town. One was in one of the best families, in the healthiest and most aristocratic part of the town. The victim was a lady thirty-eight years old, of delicate constitution, and with slight tubercular deposits in the apices of the lungs. She was sick six days and died, apparently from paralysis of the heart. I am told that two other fatal cases presented the same appearance. This lady was teacher in a Sunday-school. Three of her scholars on their way to school stopped in to view the body of a playmate dead of malignant diphtheria, and there were other children very sick with the same disease in adjacent rooms of the house. These girls with their teacher and a few others also from

Map of the Northern part of Norwich, Conn.

this infected district, occupied a seat together for about one hour. A week after the teacher and the three girls were taken with diphtheria. One of the girls died and also their teacher. This illustrates how cases may arise "in the healthiest and best localities." All intercourse with infected places should be under control of the board of health, and all contagious diseases at once reported.

This district was somewhat isolated from the rest of the city, lying near the river and composed of tenement houses with a few cottages and double cottages. Renewed outbreaks, with about a week or ten days interval, occurred until October, at which time our investigation was made. There were long ranges of pig-pens in a not over clean condition ; shallow privy vaults not over two to three feet deep ; heaps of garbage and untrapped cesspools covered with several feet of earth, whose only ventilation was through the pipe leading into the house, the coarse gravelly soil rendering it not necessary to often clean them. The worst condition was found in one of the cottages, where a perfectly flat shelf of masonry was the only apology for a privy vault. A teacupful of fluid would run over upon the ground ; hence the filth accumulated on the surface. To that was added the house garbage, and near by were the windows of the sleeping-rooms of the children. All the children had diphtheria severely, and three died. There were twelve deaths in a population not much exceeding two hundred, and many severe cases. The disease did not spread into the city to any great extent, and only when directly conveyed. The cases which are of a sporadic origin do not appear to have as great power of self-multiplication, but the disease seems to take on an epidemic character after having passed through one or two human systems. Thus, where the virus is conveyed to a new locality and allowed to smoulder, it more often bursts out in an epidemic form than where it arises apparently *de novo*. It would seem to gain more power and virulency, or perhaps more adaptability, to attack the human system by repeated transmission, like the vaccine virus that acts more forcibly one remove from the bovine, that is, after having passed through one human system. Careful disinfection was practiced in all the cases carried to other parts of the city.

In New Haven there was a localized epidemic associated with unventilated cesspools connected by untrapped pipes, unclean vaults, and similar unsanitary conditions. This was confined to one district, causing fifteen deaths in October, nine in November, and eleven from croup, probably diphtheritic. These were due to

neglect of well-known sanitary precautions, and emphasize the necessity of a sanitary inspector for tenement-houses, although these are not the only ones where there is gross negligence and its resultant of disease and death ; still their occupants are less able to protect themselves and more ignorant of the need.

Diphtheria has also been epidemic in Woodstock, from whence it was probably introduced into the neighboring town of Eastford.

The first case in Woodstock valley occurred the latter part of July in a girl aged thirteen. who was not attended by a physician, but by report, the local trouble was severe. In front of the house there is a small mill-pond which had run nearly dry for some time previous, and the general sanitary conditions around the house indicated carelessness and neglect. The second case resulted from direct exposure to this, and occurred in a neighboring house about a week later. The sanitary surroundings of this house were good. The next three cases were in the same family. The disease soon became epidemic, spreading from this as a center, and was accompanied by a large number of diphtheroid cases. Children under twelve were generally the only ones attacked. There were two deaths and, including diphtheroid cases, thirty-five cases. A common sanitary defect was found in connection with the sink-drains, most of which opened a foot or two from the house, with shallow pools and damp, filth-saturated soil.

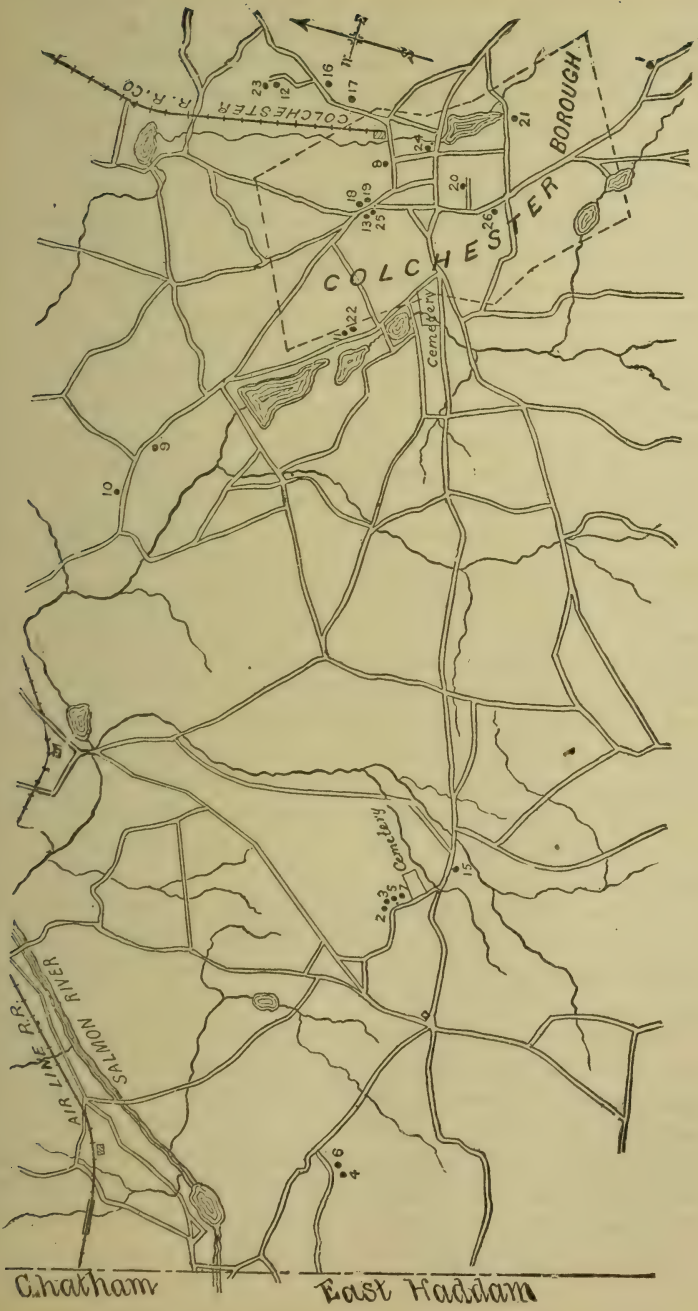
The disease has been very prevalent in Colchester and vicinity. Our correspondent writes that it first appeared August 3d ; it rapidly took on an epidemic form, and was attended with a great number of diphtheroid cases, all but one children from five to eleven years. Infants have rarely had it, nor adults—but one case known. Three deaths occurred after the danger was supposed to be over. The relapse in these cases was sudden, and death ensued within twenty-four hours. These cases were among the most severe form of the disease, where the growth of the membrane had been very extensive. The following facts are suggestive. In one house there were four fatal cases of diphtheria. The first cases were here, and at the first outbreak, in August, two children died, one within two days, the other three days after seizure. In October the disease reappeared here with two fatal cases and the same duration. The house referred to above was occupied by a washerwoman, and all the waste water and kithchen slops were, from a defect in the sink, thrown out of a back window. The house was upon a hill-side, and the slope of the land caused the

waste water to run down through the cellar wall into the cellar, so making a cesspool out of it. The two younger children first succumbed. It is probable that here was the focus for the epidemic, as the cases of sore throat preceding were, even if diphtheritic, not malignant. In a total mortality of sixty-four, from all causes, there were twenty fatal cases of diphtheria, a little over thirty per cent. In August there were two deaths, in October ten, in December five, and one each in September and November. The accompanying diagram shows the location of the fatal and severe cases.

In Eastford there have been about twenty cases and three deaths. There had been no cases there before for twenty years, and had the first case been thoroughly isolated and the surroundings disinfected, the disease might have been arrested. The disease was introduced from without, the second cases were in a neighboring house within ten days after, and were much more severe, two fatal. The disease then spread rapidly through the village, accompanied by the usual diphtheroid cases. As it is a new disease in that region, diligent care is necessary in disinfecting to prevent its securing a permanent foothold.

In North Stonington diphtheria prevailed extensively, with the usual number of diphtheroid cases ; a considerable percentage of the cases were characterized by gross negligence of all sanitary considerations. The disease appeared to be sporadic, and originated under the conditions above alluded to. There were nineteen deaths reported, all of children. There were twenty-four deaths during the year from zymotic diseases, fifty per cent. of the total mortality in that town, and equal to the whole number of deaths reported in 1877. In one house there were four cases, two of which died within twelve hours after seizure. The neglect of the ordinary laws of health and disease may continue for a long time with impunity, but the retribution is terrible when it does come. The neglected hovels of the poor and degraded often furnish prolific nurseries of death.

The cases in a family in Granby illustrate the retention of the contagion. The family (colored) lived in a miserable, filthy hovel, and in the spring of 1878 the father and several others of the family died of diphtheria. On the approach of very cold weather the bedding then used was brought into requisition again, when the disease reappeared, attacking successively the whole family and taking off two out of the three remaining. As the hut was isolated and there was little or no communication with neighbors, the disease did not


COLCHESTER R.R. CO.
COLCHESTER
BOROUGH
Cemetery
Cemetery
AIR LINE R.R.
SALMON RIVER
Chatham
East Haddam

spread extensively. There were four deaths in one family in East Granby near by caused directly by contagion from these.

The method of the transmission of this disease and the theory of its increased virulence by successive transmissions were well illustrated in a series of cases in New Haven county, as reported by the physician in charge. A lady visitor from a region where diphtheria had been prevalent, had herself a mild attack of sore throat, hardly requiring treatment. About a week after her arrival three of the children were attacked, and one died. All the adults of the family were more or less severely attacked. One of them meanwhile had left for a visit to a neighboring town, and was there attacked. After the usual period of incubation the children of the family were seized with diphtheria and one died. The disease then attacked the adults, with one fatal result. This series of cases was very carefully studied by a very intelligent observer; the houses were in an unusually good sanitary condition, and all other probable causes of contagion were considered.

One form of this disease that has been prevalent in this State seems not to be the malignant, contagious form that is sometimes encountered. The slight comparative mortality is noticeable. A false variety of diphtheria, or at least a mild form, has been very prevalent in certain parts of England, which this variety very closely resembles. The following are its distinctive features:

1. The disease is to a great extent confined to the tonsils, sometimes invading the glands of the neck, and although yellowish-brownish spots are seen, there is no tough leathery membrane.

2. The patients are anæmic, have no albuminuria, pulse usually full, average duration ten days. It is communicable, but not very contagious.

3. It is seldom fatal, and is not followed by paralysis.

It is essentially a filth disease, always associated with some organic impurity of air or water, and saturation of the soil around dwellings with slop water.

There is often a prevalence of sore throats of a non-infectious nature before an outbreak of diphtheria. Some who accept the germ theory of disease believe that an already existing organism may take on an infectious character, and in that manner explain the origin of typhoid fever, diphtheria, and the like, from unsanitary conditions, without the specific virus from a preceding case. Whether these mild cases can lead up to diphtheria or not, it

seems that the virus of diphtheria gains new strength, malignancy, and infective power by passing through a human organism, just as the most vigorous vaccine virus is that one remove from the bovine; that is, that which has passed through one human system.

SANITARY REPORTS FROM CITIES AND TOWNS.

The following are selected from reports received. These when complete from all parts of the State will form the basis for some general conclusions, and a tabulated report:

BRIDGEPORT—DR. N. E. WORDEN.

The population of the town by the last census, that of 1870, was 19,076. Since that time additions of territory have been made, and the parts just beyond the boundaries, attended in sickness by Bridgeport physicians, and reaping all the benefits of the town's people, have greatly increased in numbers. Good judges estimate the present population, including the annexed portion and West Stratford, at about 25,000.

There are no statistics available by which the number of nationalities represented can be ascertained, but from my own knowledge, I can mention the following: Irish, German, African, English, Scotch, Hebrew, frequent in the order named, so far as I can judge. Besides these, there are French, Italian, Swede, Swiss, and Norwegian.

The manufactures and trades are varied. There are upwards of 120 of all kinds, the largest being the well-known Sewing Machine establishments of Mr. Wheeler, and the late Elias Howe.

The employés of these factories live distributed in all parts of the city, an undue proportion of them, however, living in what is called the Eastern district. Most of the houses there are small, and built for tenements. Their surroundings are not such as wealth and intelligence might procure, nor is that portion of the city as well provided with sewerage as it should be, or as its more influential neighbor, the main portion of the city. Indeed many glaring violations of hygienic laws are here noticed, such as privies heaped full, cess-pools emptied out on the ground, and both in close proximity to wells which supply several families with drinking water. These causes must of course have to do with the health of the employés, as it deals with the general health. But there are special liabilities to incur certain diseases in some of

these establishments, as in the hat factory, where dyes are used, and where the fumes of chlorine are constantly being given forth, together with the great heat and the particles of wool flying about. All of these tend to cause irritation in the air passages, and to produce pulmonary diseases. In the foundries the intense heat and the violent labor required would seem to have a tendency to cause disturbances of the circulation, leading to hypertrophy or other organic diseases of the heart. The factories themselves are kept clean, and are all provided with means for full ventilation. My attention has recently been called to the frequency of pulmonary consumption among those following the profession of dentistry. A number living in this city have died of this disease, among their number several who seem to have had no inherited tendency. This may perhaps be explained by the confinements which the business compels, the cramped position in operating, and the being obliged to inhale the breath of the patients—breath which is sometimes diseased, many times foul. I think this is a subject worthy the study of the medical fraternity.

The soil of Bridgeport is at bottom sand, overlaid with clay, and topped with a rich layer of loam. Toward the north are outcroppings of trap rock in abundance, the result of upheavals. There are no geological formations of especial interest in the immediate neighborhood. The southern coast bordering the sound is low and consists for the most part of salt marshes. Numerous springs and streams flowing through, give an abundant water supply, while wells can be dug almost anywhere at a depth varying from fifteen to fifty feet.

Private enterprise has not directed its attention to the subject of artificial drainage. The city has provided well for what lies within its jurisdiction, curb and gutter having been laid almost wherever streets have been opened, thus forming an exit for the surface water. The town in the rural districts contains many acres of swamp land unimproved, which good drainage and cultivation would cause to bud and blossom. I question whether the reclamation of wastes like these does not stir up the poison of malaria.

The natural drainage has already been spoken of. The formation of the land is admirably adapted for such a purpose. Sloping as it does from north to south, the discharge of surface water is very complete. The Pequonnock river intersects the town, dividing the city into the eastern and western districts, receiving

the waste and sewerage, and discharging it into the waters of the sound. Indenting the coast are numerous creeks, admitting the tide water. The channels of these are narrowed, compelling a swift movement of the water at ebb and flow. Consequently the banks are exposed to the sun and air most of the time. If these streams should be made a deposit for refuse to any extent, it is quite certain that such dèbris, left upon the banks, would breed disease by the consequent decomposition. Such result has not yet occurred. Perhaps the healthy condition of our city is owing, more than has been thought, to the natural advantages of its drainage.

Within the limits of the town are numerous ponds of water, either natural or artificial, but in all of them the water has so much motion as scarcely to permit them to be called stagnant, The ponds called Pembroke Lake and Stillman's Pond on the northeastern boundary, approach as near to a condition of stagnation perhaps as any. This is a slowly running stream, which, alternately widening and narrowing, forms a series of ponds, extending from north to south, until it finally reaches tide water. At its juncture with the sound, a bridge with tide gates has been built for mill purposes, thus preventing a free flow. A turnpike with narrow culvert has been built within a few years, and the railroad crossing with its culvert forms still another interruption. It is a noticeable fact that the first cases of malaria occurring in this town were found along the upper borders of this stream. People living along the banks of this body of water are still grievously troubled with malaria, and the affliction is said to have increased since the building of the turnpike and culvert before mentioned.

The southern border of the town is indented with numerous creeks, the banks of which are covered with a growth of coarse sedge and salt grass. The beds of these streams when thoroughly dug out will form channels for commerce and traffic by water, for these places are destined to be the sites of manufactories. The tide in these creeks runs rapidly, and the water is quickly emptied, leaving the muddy banks dry and exposed to the sun for many hours out of the twenty-four. Attention ought to be paid to these places now, lest they be made the deposits of refuse and garbage, which, left exposed to the sun, shall become nuclei of disease. Some of the ponds supplied by fresh water streams, are diminished in volume, and the banks left dry by failure of supply owing to

the drying up of the streams in summer. This is particularly the case with the large mill pond near the cemetery in the northeastern part of the town. An artificial pond, made for the sole purpose of gathering ice, has been made, toward the northern boundary of of the town, by the side of the road formerly called Division street. This pond is flooded only during the winter, at other time being a marshy tract through which flows a small stream.

The city is well supplied with sewers which run through all the principal streets, at sufficient depths, and of size large enough (with few exceptions) to carry away all the surface water. On March 1, 1874, there were 84,162½ feet of sewer mains. There have been added up to July, 1878, 16,491½ feet, making in all 19.06 miles of sewer mains.

The sewers empty for the most part into the harbor, all of them discharge their contents into tide water. On the south side the creeks will receive the contents.

The sources of water supply are the city water works and wells, principally the former, and the supply is abundant. Its source is the various streams to the north, which have been turned so as to flow into the receiving reservoirs. These latter are large artificial lakes made by damming a narrow passway in the course of some stream, the trees in the space to be flooded having been previously felled. There is consequently considerable débris always floating in the water. These reservoirs are situated in the town of Trumbull. In case of a scant supply in summer, water is pumped into the receiving reservoir from the large pond before referred to in the Pequonnock river at North Bridgeport.

The water of the wells is mostly hard, being impregnated with lime.

The wells are shallow, springs being found at little depth. Hence these wells are often reservoirs for the drainage of the ground immediately adjacent, forming perhaps the whole of the yard. In this portion will most always be found a privy; often a cesspool, both full, and in many cases a stable in addition. For the houses are not connected with the sewers, and the old-fashioned cesspool catches ali the waste. The drainage from all these flows into the well which supplies drinking water for the household. This condition exists to a fearful extent in the eastern district and the western part of Golden Hill, where the poorer class of people live. Oftentimes the contents of the cesspool are emptied upon the bare ground, and are left to disappear by absorption or by evaporation.

I do not think there is a cistern used for drinking water in the city, nor do I believe there is a cistern supplied with a filter.

"Garbage and offal," by Chapter XV of the City Ordinances, is "declared to mean only such refuse matter as accumulates in the preparation of food for the table." The city is divided into garbage districts, of which there are three, and the removal of the refuse is done by contract. Much of it, however, is disposed of independently by private means. The city ordinance concerning the removal of garbage is not well observed. The scrapings of the streets and the contents of the sewer wells are carried through the streets in a cart which leaves its droppings along the road, and what is left is dumped upon the common grounds near the approaches to two of our most traveled bridges, and are utilized in filling up low ground; the practice is questionable in its sanitary relations. Our city authorities are much to blame for allowing dumping grounds in places so within the business limits.

There is a local health organization provided for in Chapter XIV, City Ordinances. It consists of the mayor and aldermen, who may appoint a clerk.*

The number of paupers is estimated at about 1,200. There are about three hundred heads of families with an average of about four to each family. Of these there are about seventy-five constantly at the town house, deriving their entire support thence. The remainder are helped in part at their homes in different parts of the town. The town farm consists of forty-two acres of land near North Bridgeport, on which is the almshouse, a fine brick structure, with proper buildings adjoining. The contract system prevails in the provision for the poor.

There are no public institutions for charity. The Orphan Asylum, erected by the efforts of patriotic ladies during the war, has become now the child of the city, and is supported by private benevolence. Besides the orphans of soldiers, who will soon have grown beyond the need of any asylum, such children are received as are given up by their parents to its care.

The only public institution of correction is the county jail, in the northern part of the city. The building is new, of brick, and with all requirements and modern improvements. The average number of prisoners is about sixty, a larger number during the

* An ordinance creating a new Health Board has since been passed.

winter months. The institution is well kept, and no death has occurred there of a person taken sick within its limits since the present structure has been erected.

The principal disease is malaria. The most frequent cause of death is diphtheria, the mortuary list showing between seventy and eighty deaths from this cause annually. Third on the list (consumption coming between) is disease of the heart, pneumonia following. The climate seems more particularly to develop diseases of the respiratory organs.

The accompanying map shows the location of the fatal cases of diphtheria in 1877 and 1878.

The principal source of danger to life and health is our inefficient Board of Health, for all hygienic laws are openly violated without rebuke. Next are the shallow wells in proximity to full privies and unemptied cesspools.

The registration laws are very poorly observed. Returns of births and deaths are made but once a year. Physicians are remiss. In one case no returns could be obtained until the clerk made it out.

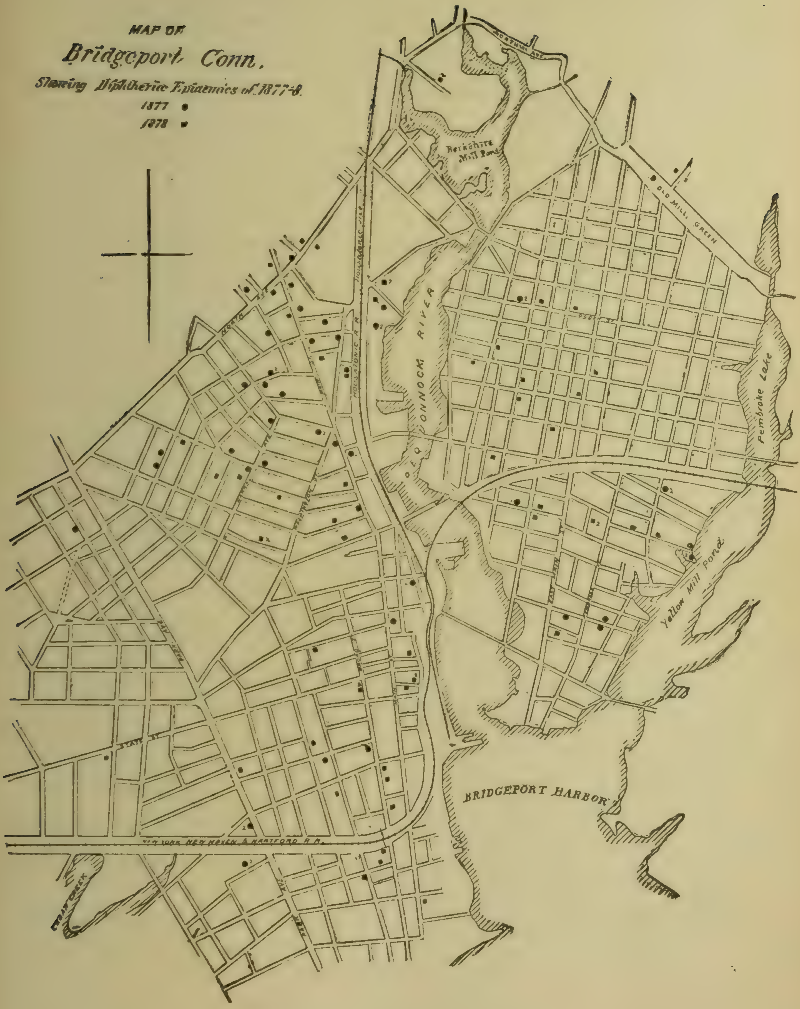
Improvements most needed are, that connections should be compelled between houses and sewers, especially where the dwellings are in blocks or flats, with plumbing under the supervision of the health officer, and the abolishment of privies. That part of the course of the Pequonnock river between the dam at the pond alluded to and the head-waters of Berkshire pond is a broad expanse of lowland, covered with a growth of stunted trees. The region is infested with malaria, and at the present time it is the only place in which diphtheria is prevalent. The course of the stream ought to be narrowed, and the whole space filled in.

For a proper registration of vital statistics, an enforcement of the laws for that purpose provided is necessary.

Illumination is supplied by the Bridgeport Gas Light Company, a chartered corporation. On the outskirts, gasoline is used, with self-feeding lamps.

NORWICH—DR. C. M. CARLTON, REPORTER.

The population, estimated at 16,500, is composed, in addition to the Americans, of Irish, German, English, French, and Scotch, and about three thousand live in tenement-houses. Pulmonary diseases amongst the operatives in the cotton and woolen mills are


MAP OF
Bridgeport Conn.
Showing Diphtheritic Epidemics of 1877-8.
1877 ●
1878 ■
Berkshire Mill Pond
OLD MILL GREEN
Pembroke Lake
Yellow Mill Pond
BRIDGEPORT HARBOR
HOUSATONIC R.R.

very prevalent. Most of them live in cottages and tenement-houses. Rockwell pond, and both Yantic and Shetucket rivers are partially dry during the summer, and the river bed in places offensive from the outhouses on its banks. The area drained by sewers is about eighty acres, and there are about three miles of sewers which empty into the rivers. The dumping-ground is Yantic Cove, which is to be filled in this manner. In some cases there are cesspools which seldom require cleaning, as the soil is gravelly and porous. Intermittent fever has appeared here this fall for the first time, except a few cases on the line of the New London & Northern Railroad, when that was built.

ELLINGTON—A. A. HYDE, REPORTER.

Estimated population 1,500; principal occupation, farming. The soil is a sandy loam, favorably situated for natural drainage. There are three hundred acres of marshy land which are constantly decreased by drainage, and when extensive ditching has been done malarial fevers have prevailed. The average depth of wells is twenty feet, the nearest privy to well fifteen feet, average distance of sink drain from well one rod. Prevalent diseases, *typhoid fever*, *typhoid-pneumonia*, *diphtheria*, *dysentery*.

COLLINSVILLE—DR. G. R. SHEPARD, REPORTER.

Population, American, three-fourths; French Canadian, one-eighth; Germans, one-eighth; Irish, one-twenty-fourth; Swedes, one-twenty-fourth. The largest number of families living in a tenement-house is seven; average, four. The principal disease, due to occupation, is grinders' consumption, from the dust inhaled. The soil is gravelly. There are no sewers of any length; the principal drainage is by roadside gutters. The bed of the pond is exposed by day and fills up again at night to a very great extent in summer. The average depth of wells is twenty feet; filth is disposed of in heaps near the house. Malarial diseases, *dysentery* and *diarrhœa*, and of late *scarlet fever* and *diphtheria* have prevailed extensively. There is no local health board except the selectmen.

SUFFIELD—DR. J. K. MASON.

The principal occupations are farming, and the manufacture and sale of tobacco, the staple crop. The soil is clay or gravel naturally, well situated for drainage, with about three thousand

acres of low, wet land, and two hundred of swampy, marshy land; about four hundred acres have been drained during the last five years. The principal unsanitary conditions are wet and unclean cellars, foul wells, cisterns, sink-drains, and cesspools. The principal diseases are dysentery, pneumonia, consumption, typhoid and typho-malarial fevers. The water supply is from wells and cisterns. mostly hard. The average depth of wells, twenty-five feet; shallowest, eight feet, and the least distance of privy and sink-drain from well, fifteen feet and ten feet respectively.

WILLIMANTIC—DR. C. J. FOX.

The population is composed of Americans, Irish, and French. About two thousand live in tenement-houses; the same number in cottages, and a thousand in boarding-houses. The greatest number of families living in tenement-houses is eighteen; average, four. The principal diseases liable to occupation are those of the lungs. The principal manufacturies are sewing-cotton and silk. The soil is gravelly and naturally well drained. An area of 150 acres is drained by sewers. The wells range from sixteen to thirty feet in depth, and the water is pure, but generally hard. The garbage and house refuse is pretty promptly carted away to the neighboring farms. The principal sanitary evils are deficient and incomplete sewerage, and poor ventilation.

DERBY—DR. C. H. PINNEY.

Estimated population, ten thousand—one-half Americans, one-third Irish, remainder English and German. A very large proportion of the employés live in cottages. The drainage is excellent; there is no flat land; the soil sandy and gravelly. There are three water companies that supply this and adjacent villages, but many bring water to their houses from springs in the hills; the water is soft and clear. The house refuse and filth is removed by the river. There are no diseases directly due to occupation. The largest number of families in a tenement-house is twelve.

NAUGATUCK—H. C. BALDWIN.

The population of about 4,000 is composed of Americans, nearly half Irish, about one-third English and Germans, and a few French, and the employés are about equally divided among tenement-houses, boarding-houses, and cottages. The largest number

of families in a tenement-house is six. The principal manufactures are rubber, iron, cutlery, and woolen. Those that work in the cutlery shops are subject to grinders' consumption, and those in the rubber and woolen mills are more liable to diseases of the lungs. The natural drainage is excellent; the Naugatuck flows through the center, and there are no bodies of stagnant water. There is not sufficient care taken in summer to cleanse and deodorize privies and cesspools, and as the soil is very porous, the wells often near, they may become contaminated. Typhoid fever and malarial diseases are prevalent.

PLAINFIELD—REV. J. H. FELLOWS.

The principal occupations are farming and manufacturing cotton and woolen goods. The soil is sandy and favorable for drainage. There is but little wet and undrained land. Consumption is the principal cause of death. Typhoid and scarlet fevers prevail. Water is obtained from wells and springs, the former hard, latter soft. Some of the wells are but six feet deep; average, twenty; deepest, sixty. The least distance of privy from well is fifteen feet, of sink-drain, ten feet; average, twenty-five feet. The principal unsanitary causes arise from an insufficient supply of water and the conditions above described. A gradual form of paralysis is the only peculiar form of sickness I have noticed.

SECOND ANNUAL REPORT

OF THE

STATE BOARD OF HEALTH,

FOR THE

Fiscal Year Ending November 30, 1879.

Printed by Order of the Legislature.

HARTFORD, CONN.:
PRESS OF THE CASE, LOCKWOOD & BRAINARD COMPANY.
1879.

State of Connecticut.

Office of the
Secretary of the State Board of Health,
State House, Hartford, Dec., 1879.

To His Excellency Charles B. Andrews, *Governor of the State of Connecticut.*

Sir: In compliance with the laws of this State, I have the honor to present to you the accompanying report for the fiscal year ending November 30, 1879.

Very respectfully,

C. W. CHAMBERLAIN, M.D.,
Secretary of the State Board of Health.

MEMBERS OF THE BOARD.

	Term expires.
John S. Butler, M.D., President, Hartford,	July, 1880
A. C. Lippitt, New London,	" 1880
A. E. Burr, Hartford,	" 1882
R. Hubbard, M.D., Bridgeport,	" 1882
C. A. Lindsley, M.D., New Haven,	" 1884
Prof. W. H. Brewer, New Haven,	" 1884
C. W. Chamberlain, M.D., Hartford, Secretary.	

GENERAL REPORT.

The past year has brought forcibly to public attention the close connection between public health and material prosperity. The prostrating effects of a general epidemic upon the business of a city, and the influences checking growth and development, as well as the direct losses involved, have been plainly illustrated. The lessons derived from the wide-spread epidemic of the previous year were startlingly emphasized and enforced. The unsanitary condition of very many populous places, and the neglect of the laws of public health, as shown by the almost universal contamination of air, soil, and water, in all the places invaded, was evidently one of the most important causes in producing the epidemic of 1878, if not the producing agency. The outbreak of the fever in 1879 in Memphis, where the local conditions were undeniably worse than in the other southern cities, its localization there by quarantine, and the perfect control of repeated outbreaks in New Orleans by well-enforced sanitary measures, afford striking illustrations of sanitary laws, that pollution of the requisites for healthy life cannot proceed with impunity, as well as the power to prevent the outbreak of diseases that cnce developed cannot be controlled. The remark of Col. Waring at Nashville, "that yellow fever is, after all, one of our minor diseases," is significant. We hardly realize that unsanitary conditions in a quiet way destroy multitudes each year, while epidemics are infrequent, and the mortality, though strikingly impressive, is but slight in comparison to the waste of life from preventable diseases, the results of neglect of sanitary regulations. Consumption, diphtheria, scarlet fever, typhoid fever, and like diseases cause the needless loss of many lives, but they attract little attention, and the accumulations of filth continue to increase, unless some epidemic occur, and even then a partial recurrence may be required to induce action.

Yellow fever occurred in several places in this State in earlier years, and a few years ago there were four deaths from this dis-

ease in New London, from a ship that ran into that port to evade the quarantine at New York. One death was reported in 1878 from Stonington, from yellow fever, but on investigation it was found that the captain of the ship visited an infected port, was taken with yellow fever, died, and was buried at sea.

The Board were consulted by various local health organizations with reference to refugees from Memphis, and in several instances where carpets and bedding had been used in connection with yellow fever cases in 1878, it was recommended that these goods lie unpacked until winter, and be then disinfected and aerated. This course was pursued in regard to unpacking the goods, which were stored until the winter months. There were quite a number of refugees in Connecticut from Memphis.

THE IMPORTATION OF RAGS.

New Haven is the only port in this country that receives whole cargoes of rags. These come for the most part from Egypt—the companies have an agent there and extensive shipments are made. The principal garment of a large part of the population is a long cotton robe reaching from head to feet nearly, hence cotton rags are abundant. These rags are torn up and pressed into bales at Alexandria. Upon the outbreak of the Oriental plague fears were entertained lest the disease might be imported through the medium of these rags. The companies were conferred with, and orders given that no further collections be made from the infected region or southern Russia. The port of New Haven was visited, and it was there ascertained that, owing to the time required for the trip, the cargoes of the vessels under way and loading must have been collected before the outbreak of the plague. The subject was brought to the attention of the National Board of Health, which issued an order relating to the disinfection of cargoes from infected ports. Similar action was taken by the quarantine authorities in Great Britain. If disease could be conveyed in this manner, the danger would be where the bales are opened at the paper mills, as the rags are imported in closely pressed bales. The health of the sailors on these vessels was investigated, and no cases of sickness discovered while in port, and apparently none at sea. The reports generally from the manufactories in this State show that small-pox is the only disease that has been communicated by rags, and that from domestic rags in a few instances; the law obliges all operatives in paper mills to be vaccinated, and it is recom-

mended to mill overseers that the law be strictly enforced. The British government appointed a commission to investigate the transmission of disease by rags, and as a result of inspection of the principal mills in England, and the records for a long period, extending over twenty years, no other disease than small-pox was found to have been communicated, that is as in this country, no other epidemic contagious disease. Of necessity, researches on other forms would be incomplete, uncertain, and unsatisfactory.

SCARLET FEVER IN THE ORPHAN ASYLUM.

A few years ago there was a rather mild epidemic of scarlet fever in the Hartford Orphan Asylum, then occupying its old quarters on Washington street. The type of the disease was not particularly severe, but every child that was admitted subsequently had scarlet fever, but no other cases developed from these, although all the inmates did not have the fever in the first instance. It was considered an undesirable state of things to continue, and the aid of the Board of Health was invoked. It was directed that all the articles of bedding, carpets, curtains, and woolen articles generally that had in any way been connected with cases of scarlet fever be brought into one room and disinfected by burning sulphur, and specific directions were given as to the quantity to be used for a room of a given size. The iron and wood-work of the furniture was ordered to be repainted after disinfection, the woolen articles to be thoroughly aerated. These directions were well carried out and no further cases of scarlet fever occurred, neither was the disease transmitted to the new building where the asylum was in a few months afterwards removed. Several admissions had meanwhile taken place. The inmates slept in large dormitories which were then frequently white-washed, so that no infection would be liable to linger in the walls, but apparently in the bedding.

PROMINENT FORMS OF DISEASE.

The general health of the State during the year 1879 has apparently been for the most part satisfactory. Malarial diseases have been decidedly prevalent, involving new territory at apparently a pretty uniform rate. Some discussion of malarial fevers in the Quinnipiac valley will be found in the special reports. The fatal forms are congestive fevers, typho-malarial, and bilious remittent. The ill effects of malarial diseases are not to be estimated alone by the death rate, as the proportion of fatal cases is slight.

The number of acute cases does not, when also included, entirely cover the case, as these diseases readily become chronic, tend to recur and linger, preceded and followed by a period of malaise that interferes to a great degree with health and comfort, and also lessens very materially the working capacity, and the hours that can be spent in labor. Their effects are seen also in other diseases, persistent enlargement of the liver and spleen, malarial rheumatism, and a peculiar form of spinal tenderness; indeed, the connection between malarial disease and cerebro-spinal meningitis, at least so far as localities are concerned, is a close one. A tendency to pelvic congestion is also reported, and trouble in obstetrical cases from the depression induced.

The relation of drainage to malarial diseases, and the influence of local causes,—soil saturation and retained moisture,—to the production of malaria, are becoming better understood. It is only comparatively lately that the importance of systematic drainage for health has begun to be realized. In our own State, largely through the influence of this Board, extensive drainage for the removal of malarial disease has been undertaken. The experience of Michigan, New Jersey, and other States and countries, affords every encouragement. Careful study will doubtless reveal removable causes wherever malarial diseases exist generally or locally; the connection between subsoil or ground water and their prevalence will in many instances furnish the explanation of otherwise apparently obscure cases. In another connection this subject is further treated, and a full discussion of drainage for health is hoped for by the time our next report is ready, and accurate data have been secured. While railroads, dams, and embankments are in process of construction, cities and towns occupying new territory for building purposes, and the grading of grounds and roadways extensively carried on, natural water courses receive but little attention, nor in constructing sewers in cities has there been attention enough paid to the natural drainage ways. The influences of this neglect have been more closely studied in New York city than elsewhere, and the close connection between the retention of ground-water from obstructed water courses malaria and cerebro-spinal meningitis especially have been repeatedly shown.

Typhoid fever has been for many years a prominent disease in this State. Its recurrence this year in Hartford after comparative infrequency is a significant fact in connection with the renewed use of the river water for drinking. There seems to have been a

steady increase in both typhoid and typho-malarial fevers since the epidemic of diarrheal disease in the fall of 1878. The river water, while freed from direct sewage contamination here, receives the sewage of Springfield, and is by far inferior to the West Hartford supply. A comparison with other waters used for public supply is here given:

	Conn. Riv.	N.Haven supply.	Boston supply.	Wells.	Thames, London, Eng.
Total solids (gr. per gall.),	4.200	3.300	not	5.700	19.600
Volatile, below red heat (gr. per gall.),	1.500		giv-	0.000	00.008
Chlorine (gr. per gall.),	trace.	0.220	en.	0.060	00.088
Free Ammonia (parts per million),	0.014	0.008	0.004	0.001	00.000
Albuminoid Ammonia (parts per mill.),	0.030	0.020	0.015	0.005	00.008

A trace of organic impurity is indicated by the albuminoid ammonia. The absence of chlorides in the specimen examined is singular, and must have been accidental. It is hoped that after this year the river will not again have to be resorted to for drinking water. Among the cities of the State, Meriden has one o the best sources of water supply,—upland surface water from an uninhabited, uncultivated water-shed, and abundant as to quantity.

Typhoid fever does not prevail extensively in well-sewered towns with a pure water supply, and the close, if not causal relation of contaminated water to typhoid fever and diarrheal diseases is so marked as to lead to an examination of the water in seeking for their cause. When entering the system through this medium, about one-third the time is required to produce the disease than i the case when through the medium of the air. It is a disgusting fact that excrement is allowed to gain access to air or water and is again taken into the system; yet typhoid fever, dysentery, cholera, and the like, are disseminated in this manner. The dejections of a typhoid fever patient thrown into a vault may preserve the specific virus or germs of typhoid fever, whichever it may be, for years if the vault be uncleaned, and then they may enkindle the disease. Experiments have proven the vitality of the germs of diphtheria for at least three years. The importance of disinfecting the dejections of typhoid patients cannot be too strongly urged. The duty of prevention of the possibility of future infection should be recognized. Copperas solution, the salts of zinc, or the dry earth system will secure this result. Indeed, both typhoid and enteric fevers are largely due to excremental contamination of air, earth, or water.

Diphtheria has not been developed in epidemic form so frequently

as in 1878, but the instances of whole families of children destroyed by it are by far too frequent. The circular of the Board has been pretty well distributed, is often now called for, and apparently has been very serviceable. Separation, even at short distances, of the uninfected, careful isolation of the sick, systematic ventilation and disinfection, as there recommended, will do much to limit the disease. It still remains endemic in Bridgeport, but much more decided sanitary measures must be enforced there before zymotic diseases become infrequent.

Consumption is still the most fatal scourge in this State: 1,316 deaths are reported as due to this cause, the greater number between the ages of twenty and thirty, at the most efficient period of life it also renders life less efficient and useful, lessening the vital powers and endurance. Careful investigation has shown that 24 per cent. only of the cases of this disease are due to inheritance;* the remainder are the resultants of the direct violation of sanitary laws, for instance, dwelling upon damp, undrained sites. Houses frequently can be shown that have never had permanently healthy occupants, and too often the house and its surroundings cause that disease that is attributed to inherited tendencies. Another most prolific cause is breathing impure devitalized air, re-breathing air that has been deprived of its life-giving principles by repeated passage through the lungs; each time 5 per cent. of oxygen is replaced by as much carbonic acid. It must also be remembered that one contaminates more air than he breathes by the animal vapors, products of decay he breathes into the air, and by the exhalations from the skin. The foundations too often are laid in the devitalized air of the house contaminated by the gases of decay drawn in from a filth-saturated ground-air, resulting from retained excretions, and waste incident to house life, from the decaying vegetables and neglected filth of a damp cellar; and sleeping at night in small unventilated chambers. The process is hastened by the like conditions in the crowded school-room; with its sharp alternations from heat to cold. And if the dust-laden air of factory or workshop be superadded, the termination is soon reached. The greater proportion of cases among those whose occupations keep them indoors is a significant fact in this connection. Catarrhal troubles and lung fever are also induced by impure air. An epidemic of typhoid pneumonia was traced

* Fox's Sanitary Examination of Air, Water, and Food.

during the year to bad sewerage, to which all those affected were exposed. Several of the cases were fatal.

There are many types of disease influenced by unsanitary conditions as well, and which can and will eventually be stamped out by efficient sanitation. It is gratifying to note that improvement follows the diffusion of knowledge, and that although opposition may at first be enkindled and indignant denial of the possibility of anything wrong existing, a calm, second thought induces action eventually.

The attention of the Board has, in several instances, been called to private nuisances, and instances where the unsanitary conditions maintained by neighbors caused trouble for those whose own affairs were well regulated. There seems considerable difficulty in dealing with a perverse neighbor in a country village who pollutes your well by a vault or cess-pool within a few feet of it, or even contaminates the air for a whole school by extensive pig pens or vaults, or induces malaria by damming the outlet of extensive swamp lands. Just how to meet these cases is not apparent. Some additional legislation is necessary, but just how to frame it is another matter.

SEWAGE DISPOSAL AND POLLUTION OF RIVERS.

These important subjects were brought to our consideration first by the application from the people of South Meriden and Yalesville, to investigate the pollution of Harbor brook and the Quinnipiac by sewage and manufacturing waste; and later, by the invitation from the Mayor, Common Council, and Health Board of Meriden, to inspect the city, and report its sanitary requirements. The general status of the principal questions involved is given here as far as they can be gathered from the sanitary publications of this and other countries. There is no general law with reference to sewage pollution of rivers in this country, and no other law in this State than special enactments concerning the preservation of the purity of waters used as a source of supply for towns or cities. A partial report was made to the legislature of 1878, with the draft of a law with especial reference to the use of rivers for drainage. The questions involved in the Meriden case, the disposal of sewage of inland towns, the use of rivers as outlets for sewage and drainage, are of such general importance that we have spared no effort in attempting their elucidation. We have secured maps of the basin of the Quinnipiac and of the topography of Meriden. It is hoped in time to secure accurate details of the topography of the whole State, as there

are many facts thus to be learned of the utmost importance in relation to the prevalence of disease. This question of the ultimate disposal of the sewage of Meriden, which is the principal one involved, although the drainage of the low-land is of no small importance, has been frequently and repeatedly discussed by the Board. The brooks in Meriden have been carefully traced as well as the course of the river, and several investigating committees have been over the ground in winter and summer. The local conditions in Hanover and Yalesville have also been carefully studied. Here several complicating elements come in. The river receives the manufacturing waste of the large cutlery works in Hanover. Many of the house lots in both villages are small, and the cesspools and vaults, either one or both, are in some cases not much over fifty feet from the wells, and the soil a few feet below the surface coarse gravel, then sand again. In several instances the cesspools were ventilated into the house only as described in our circular on house drainage. I have never yet failed to find illustrations of this wherever cesspools are in use to any extent: man can easily spoil a naturally healthy location. On the contrary, in other instances the utmost care and intelligence were manifested in the sanitary surroundings of the houses in Hanover and Yalesville, the two villages interested more especially in the use of the river. A careful survey of the wells in Hanover was made, and reference will be made later. This was done by an engineer employed by Hanover.

The best sanitary disposal of sewage is by irrigation, or by intermittent filtration and irrigation combined. The method of downward filtration is recommended because it is economical of land as well as efficient—but one acre required to three thousand inhabitants,* and two or three acres used at a time, the land used every third year, so that practically one acre to a thousand inhabitants would be required. In Silesia, where there is a very extensive manufactory of beet root sugar and a scarcity of water, all water that has been used in the manufactory, and all waste and foul liquids, are discharged on a well-drained piece of ground, the filtered water collected in a well, and the clear pure water thus resulting is used in manufacturing sugar; the process is described by Liebig. This process is adapted for isolated dwellings, *i. e*, intermittent downward filtration wherever small plots of land are available, and is by far preferable to cesspools; stored up accu-

* Denton's Sanitary Engineering, page 61, *et passim.*

mulations of filth are an abomination. However it may be in regard to other sciences, the Bible taught true sanitary science, and for adaptation to their habits of life, the sanitary code given the Jews was perfect.

In intermittent filtration the sludge settles to the bottom of the furrows, then covers the sides, and after that new land must be used; the sludge is allowed to partially dry and is then dug or plowed into the land, new furrows constructed, and the land ready for use. In Gennevilliers, near Paris (Paris sewage), these furrows are between the ridges of growing plants, and the sewage never directly touches the vegetation. "The soil acts mechanically as a filter, while the oxydizing action of the air on the soil and the growth of vegetation bring chemical agencies into operation, and decompose and assimilate the organic and other compounds in the sewage which may be available as fertilizing ingredients."

Frost does not materially interfere with the processes of irrigation or downward filtration; in the latter case the sewage sometimes thaws the land in the furrows if not frozen very solid. In winter the effluent water is slightly less pure, as there is no aid from vegetation. In the first description of the plan by Frankland in 1868, he states: A plot of five acres well and deeply drained (by porous tile) to the depth of six feet should be rendered as level as possible, divided into four plots and furrowed, each plot receiving the whole sewage for six hours. In this way, he states, the five acres would suffice for a town of 10,000 provided with water-closets. "Such a filter is a field for oxydizing and is analogous to respiration on an enormous scale, as the land gives out air to the filthy water trickling through it, and takes in air through the period of rest." The value of sewage for manure is estimated at two pence per ton by Denton.

Sub-irrigation is practiced successfully at Lenox, Mass., in this country, and sewage irrigation successfully at Worcester, Mass., at the Lunatic Asylum, so that the objection of the severity of our climate cannot be urged against either method, the one for isolated houses, small towns and villages, or the plan for inland cities. In Kendal, England, five and a half acres of land are used for the downward filtration of the sewage of fourteen thousand inhabitants—two million gallons in twenty-four hours. The plan has been satisfactorily in operation five years. Irrigation and filtration are in use in sixteen towns in England—precipitation in tanks at

Birmingham,* precipitation by chemicals at Leeds and three other cities, the pail system at Halifax and Rochdale—from the latter place that system takes its name. Berlin, Paris, Dantzig, and other cities might be mentioned, where the irrigation system has been successfully in use, wholly or partially. The works for the city of Paris are made more extensive from time to time; ultimately it is hoped to remove sewage from the Seine altogether. By act of Parliament no new sewers can be constructed emptying directly into rivers. The committee which reported in 1876, of which Robert Rawlinson (the highest living sanitary authority) was chairman, state, among other conclusions,* that "town sewage can best and most cheaply be disposed of and purified by the process of land irrigation for agricultural purposes. The sewering of towns and draining of houses must be considered a prime necessity under all conditions and circumstances, so that the subsoil water may be lowered from wet districts and may be preserved from pollution, that waste water may be removed from houses without delay, and that the surfaces and channels of streets, yards, and courts may be preserved clean; that the existing modes of treating town sewage by deposition and by chemicals in tanks does not effect much change beyond the separation of the solids and the clarification of the liquid."

There has been no further progress in this department, and this report represents the state of the subject in Great Britain, the most advanced country in the world in sanitary science and its application.

As stated elsewhere, Col. Waring, in his paper on the disposal of sewage, advocates the exclusion of surface or storm water from the sewers, and a separate system of drains for the subsoil water. There is much force in the objection to many of our sewers, as constructed with porous sides. If they will admit the entrance of the ground water, they will also allow the exit of the sewer water, and give a filth-reeking soil, besides polluting the ground water, always a prolific cause of disease.

In studying the Meriden case, the services of Col. Geo. E. Waring as sanitary engineer were secured, and the substance of his report will be found in the detailed report of our investigations. The plan of sub-irrigation has been mentioned as in use at Worcester and adapted to detached houses and small farms. In brief it is

* See Report of Committee on treating town sewage, Local Government Board, London, 1876.

managed as follows: small drain-tiles are laid in a network a few inches below the surface of grass land, and the sewage conducted into them by a flush tank preferably. The latter is illustrated in our circular on house drainage.

STATE PRISON INVESTIGATION.

At the request of the directors, a committee was appointed to inspect the State Prison, and Prof. W. H. Brewer and Dr. Chamberlain were appointed by the Board. Three visits were made, and a report in writing submitted to the directors on certain definite and fixed questions which were asked us by them. This report was published by the directors. The final report of the chairman, Prof. Brewer, will be found among the special reports. The presence of insane convicts is to be deprecated, especially those completely demented, of which there are now a few at Wethersfield.

Several years ago a law was passed requiring the trustees at Middletown to receive insane convicts after a proper examination, which was specified, and a commission appointed. A commission was lately appointed by the Governor to examine as to the insanity of these convicts. This committee reported them to be insane, but they are still in the prison at Wethersfield, where no proper accommodations for their care exist. There are no regular provisions at Middletown for the care of insane convicts, and it would seem that altogether different provisions should be made for their care than for ordinary cases of insanity, and greater safeguards especially for those manifesting a homicidal disposition. Nor should they be mixed indiscriminately with other non-criminal insane, even when not of the dangerous class. A separate wing in the regular asylum for the insane, where might be confined all the insane that manifest a homicidal tendency, or the dangerous, and those difficult to treat from any cause, as recommended by the committee of the New Jersey State Board of Health, seems a most satisfactory, feasible, and reasonable plan. There does not seem to be any commendable system on this subject in any State in the Union. In Perth, Scotland, there is a criminal lunatic asylum.* Here two classes of cases are found: 1st, Those found by the law insane at conviction. These can be detained as long as there is any danger of recurrence of the homicidal mania. 2d, Those

* See Second Report New Jersey State Board of Health, page 34.

becoming insane after imprisonment. If fitted for an ordinary asylum they are transferred at the expiration of their sentence, otherwise they are detained at the criminal asylum at the discretion of its authorities.

IMPURE ICE.

Through the kindness of Dr. Orlando Brown of Washington, Litchfield county, under whose care many of the cases were, I am enabled to place on record the history of cases of disease resulting from impure ice. Through the agency of this Board, in several instances where large supplies of ice were cut from sewage-contaminated ponds or streams—indeed, so near to sources of contamination that it would seem no outside interference would be required—these sources have been abandoned, and purer supplies sought. No cases of disease were traced to the ice in the instances named, as the supply was so general throughout cities, but doubtless such cases did occur, and some of the apparently strange cases have been thus caused. However that may be, it is undesirable to use impure ice, and we are using all means to illustrate and enforce the fact that water is not purified by freezing when it contains any considerable amount of impurities. These cases are similar to the results published by Professors Wood and Sharples, in the Massachusetts reports, and of Dr. A. H. Nichols, in regard to the impure ice at Rye Beach and the epidemic that followed its use, published in the seventh report of the Massachusetts Board of Health.

DRAINAGE FOR HEALTH.

In our first report is published a portion of the correspondence with parties in the town of Fairfield, relative to drainage, and retention of ground water by the obstruction of natural water courses with the existence of extensive marshes, and the relation of this condition of affairs to the malaria prevalent there. A written report was afterwards sent, briefly stating the relation of malarial diseases to such conditions as were there found. A few months later, an invitation to deliver a public lecture was received by the Secretary, and in response, a lecture on drainage for health was delivered to a very appreciative audience. It was the intention to have shared the evening with Prof. Northrop, who had been written to at the suggestion of the Secretary, and to have proceeded to the formation of a Village Improvement Society then and there. Prof. N. was, however, at the White Mountains, so the

whole evening was occupied by the sanitary lecture; allusions only made to the value of organized effort for village improvement. The publications of the Board were freely supplied. As will be seen by the paper of Mr. Sturgis, to whose intelligent and whole-souled liberality this grand movement for public improvement is due, an organization was afterwards effected, and much has been already accomplished. This is the first instance, so far as I know, of extensive and systematic drainage for health that has occurred in this State, and it is a noble example to follow. The retention of the ground water was doubtless the cause of the prevalence of malaria in this "historic town," as there is no other cause for such a condition of affairs. The soil is naturally easily drained, if there be no obstruction. The only other unhygienic condition was much too dense shading by trees and ornamental shrubbery, inducing dampness of the soil. This can be readily obviated by thinning and trimming.

GLANDERS.

Several suspected cases of glanders were discovered in the City of Hartford, and the Commissioners on Diseases of Domestic Animals, Hon. E. H. Hyde and T. S. Gold, met with the Secretary of the State Board of Health, and the Chairman of the City Health Board, Dr. Noah Cressy of Amherst, Mass., a veterinary surgeon, called as an expert to examine the horses, reported five as unquestionably glandered. A valuable horse was killed by its owner, the disease having been communicated from these cases. The five horses were old, nearly worthless animals; they were all eventually killed. In France the skin is slashed to render it worthless, as the disease may be conveyed by the skin of the animal.

The keeping of such animals in the city was declared a public nuisance, as glanders is an incurable disease, and may be conveyed to man (a fatal case was soon after reported from Waterbury). It was advised that the horses be killed at once. All owners of horses were informed of the danger, if they possessed glandered horses, of loss to themselves, or in damages to others if they harbored the disease. By this prompt action a great deal of mischief was probably prevented, as the disease had commenced to spread. Horses that had been removed to the country to avoid detection were either hunted up and killed, or their owners brought so to realize the risks they were running that they voluntarily killed the affected animals at once. The importance of prompt and decided

action here is apparent. The disease more often appears at first in old, worn-out horses, where it runs a chronic course for many months; but if it attacks young, full-blooded animals, its course is much more acute and fatal. Such animals should be killed at once.

CORRESPONDENTS.

The number of correspondents of the Board has steadily increased, and their zeal and interest in the work have suffered no diminution. The amount of work done by them for the Board deserves our warmest gratitude. Their voluntary assistance has been of inestimable value, and the information conveyed of permanent interest. The registrars of the more populous places have our warmest thanks for the interest they have manifested in the execution of the laws, and the promptness of their mortality returns. Reports concerning the health of towns will be found in the appropriate place.

PUBLICATIONS.

The first two editions of the circular on diphtheria have been exhausted, and a third issued. Applications, indeed, have come in from all over the land, and single copies have been sent. The circular on restoration of the drowned proved very popular. Copies are in stock for a wider circulation when the bathing season recommences. It is issued in two forms, one for posting in public places, the other for the pocket memorandum book. The Board are indebted to the State Board of Health of Michigan for the circular and use of the plates. A compilation of the laws relating to marriage has been issued, and the registration laws will be contained in our annual report.

LIBRARY.

The inestimable value of the reference library already collected has been proven in multitudes of instances in answering the many calls for information on some special sanitary topics, from all classes, clergymen, teachers, physicians, and *mothers*, who take an especial interest in the work of the Board. This will, as a matter of course, increase in value each year. Only works of permanent value are purchased, but current exchanges and the scrap-book are of great value. Indeed, the newspaper cuttings fill a very important place that would otherwise remain unoccupied.

MONTHLY MORTALITY AND SANITARY REPORTS.

These have from month to month grown more comprehensive, and apparently are attracting a wider circle of readers, as oftener, by far, questions concerning some statement contained in them are sent in. If our correspondents maintain their interest, which indeed seems on the increase, our reports must of necessity become more valuable as they include a wider area. Soon we can commence comparative statements.

THE SEWERAGE OF NEW BRITAIN.

This subject was brought to our notice by the inhabitants of Newington, an adjacent town, who feared excessive contamination of one of the branches which form Little or Park river, which, flowing through Newington, joins another branch at West Hartford to form the river which flows through the Park in Hartford, and empties into the Connecticut at Dutch Point. As this river is one of the sanitary nuisances in its course through Hartford from the amount of sewage it receives, it was an interesting fact to learn that already over a third of the sewage of New Britain was discharged into one branch, and how far this was polluted was a question of interest. So far as New Britain is concerned, the system is an excellent one. Nearly all the sewers are to empty into one large trunk sewer, and a third or more of the city is sewered. A brook is turned into this main sewer, so that it is kept constantly flushed. The sewage is well mixed with water by the time it leaves the outlet of the main sewer, and the committee of the Board, Prof. Brewer and Dr. Chamberlain, found but little odor at the mouth of the sewer at midsummer. The course of the stream is such as to subject the water to constant aeration as it spreads out over shallow rapids or smooth pools along its course. Long before it leaves Newington all apparent trace of sewage contamination is lost, nor was there any decided contamination discoverable by analysis after three miles run along the tortuous, rapid stream. There is a large amount of vegetable growth along the banks and margins fringing the stream, which doubtless aids in removing any impurities.

SOIL CONTAMINATION AND RESULTS.

This is a subject of the greatest importance, and the paper by Dr. C. A. Lindsley, Health Officer of New Haven, is one of the most

important that has been brought to the attention of the Board. The relation of contaminated excrement-sodden soil to the prevalence and indeed existence of many of the forms of disease that scourge us has never been so fully understood as of late. This contribution, to our knowledge, is well worthy thoughtful study, as it is the result of careful attention and observation. The organization of the Health Board at New Haven is very efficient, and furnishes a good field for study upon sanitary topics, as well as for the accomplishment of good hygienic work. The results are seen in a city that has the lowest death rate for a seaport town of any city of the same size in the world.

SCHOOL HYGIENE.

A preliminary paper on this subject is furnished by the Secretary. Some aspects of the subject are presented, and a circular of information, hints on the hygiene of school houses, prepared for school committees and others who have to do with either the alteration of old buildings or the construction of new. Many of the schools in this State have been visited, and many buildings in other States. A complete survey of this State is intended before the final article on this topic is written.

SALE OF POISONS.

The attention of the Board has been forcibly directed of late to the desirability of some limit to the indiscriminate sale of poisons in this state, especially those generally used for criminal purposes. The most feasible expedient yet reached appears to be the registration by the druggist of the name and address of the purchaser, with any other identifying marks or circumstances that may occur to his attention. The mere fact that such a record is to be kept would act as a slight check. This should be confined to active poisons like the compounds of arsenic, strychnine, and the like, as the effect is weakened if a large list of unlikely agents be included. In a supplementary list discretion might be left to the druggist. We hope to have a bill in readiness for the present legislature.

FUNCTIONS OF MODERN BOARDS OF HEALTH.

PROF. W. H. BREWER.

Other topics that have engaged the attention of the Board may be found in the special report of the secretary and in the papers on special subjects. The general scope and field of labor of a board of health is so well expressed by the paper of Prof. Brewer that it furnishes the best conclusion of this report that could be afforded.

Modern *Boards of Health* are the official organizations by and through which communities try to use the teachings of science for the prevention of disease. They have become a necessity, partly because of that large class of new dangers to health which have grown out of the changes wrought in our modes of business and life, and partly because of new applications of science. Our civilization has become more complex with the modern methods of doing business, particularly in the production and distribution of articles in common use by the masses, and one result of this change is that a man's safety from contagious disease is now relatively much less under his own control than when business methods were simpler. Even in his general health, he is now more liable to suffer for the sins of the community than he was when population was more sparse and before stock companies and other organizations supplied him with water and gas in his house, produced so many of his foods, drinks, and clothes, before steam transportation brought his food and other articles from so many and such distant regions, and before travel was so easy, speedy, and common.

These modern improvements, while beneficent as a whole, have introduced so many new sources of danger that they have made boards of health a necessity. So great is the necessity, that in many cities the rich and intelligent are organizing stock companies, societies, and associations for the protection of the members or stockholders from these new dangers, particularly against unwhole some adulterations of foods and drinks.

Official boards of health, taken as a whole, differ greatly in their constitution, organization, scope, and powers. Their aim is always the same—the furtherance of the public health. No other department seems more simple in theory, but as we find them in actual operation they differ more in their methods and scope than any other department of civil government. This is partly because of the newness of the subject, and partly because of the nature of the work they are asked to do.

It is well, therefore, that each locality for itself should often discuss this subject in the light of its own conditions and needs. In a case like our own, where a special board is a new thing, where its legal powers are still illy defined, and where its special and proper work is but imperfectly understood, it is particularly desirable that a discussion of its functions, methods, and uses be kept up until the community is educated into a better knowledge of sanitary science, and the board itself into a better understanding of the work it can do for that public whose servant it is.

The simplest form of a health board is the old one, devised in some previous century, and which still exists in this State at large, where its special functions, so far as they are performed at all, are performed by officers elected more especially for other duties, and rarely, if ever, chosen because of their having given special study to sanitary science. Such boards rarely perform active duties relating to the health of the public other than the most general and obvious one, unless on special occasions or emergencies, as, for example, when some disease becomes conspicuously epidemic, or small-pox occurs, or when unusually prevalent sickness is popularly attributed to some local cause. The efficiency of such boards is very variable. They have legal power enough, but usually lack the special knowledge required for good results. It sometimes happens that the work of such boards, in small communities, is reasonably efficient; more often they do nothing until an epidemic has set in, it may be not until after a panic has arisen, and then their work is wildly done, and without technical knowledge of what should be done. It is the attempt to use the pound of cure because the ounce of prevention has been neglected. Many a town, in recent epidemics, has found to their great cost how utterly inadequate to modern wants was a health board whose constitution and methods were devised long ago, for a smaller community, and before the modern methods of production, transportation, and travel were known.

It is just as wise for a modern city to rely upon the poor hand-pumps of the last century to suppress fires as on the last century's methods to suppress disease. If we are wiser in the protection of our property than of our health and lives, it is simply because a knowledge of mechanical science and invention is more widely diffused through the community than a knowledge of sanitary science and its applications.

The next step for the better is a separately constituted board to attend to this special want, and whose members are supposed to have a fitness for its especial work. But even here, we find still greater range of scope and operation than in the simpler board already described. The special board may be hampered by legal restrictions and uncertainties, or by lack of other municipal coöperation, or by popular or official ignorance and prejudice, or by a multitude of causes, not the least of which are the political customs of the community. Hence in one place it may be strictly confined to the prevention or suppression of epidemic and contagious diseases that are actually occurring, in another, in addition to this have more or less to do with the causes and sources of disease; next we find them collecting or classifying the vital statistics, because of the obvious relation between mortality and disease.

In other localities we find duties put upon them heretofore divided among other departments, such as the removal of garbage, the cleaning of streets and sewers, tenement-house supervision, inspection and more or less supervision of foods and drinks sold in the markets, the sale of poisons and medicines, the sanitary arrangements of schools, the supervision of unwholesome trades, and so on through a great variety of functions, and with plausible show of reason, because all of these things affect in some way the health of the community. How far this is sometimes carried is shown by a late order of the health board of a certain foreign city, prohibiting the ladies from dragging their trails in the public streets on the score of injury to the public health.

Now, it is for each city for itself to determine where, between these extremes, the functions of its own local board shall be placed, and that this be wisely done and for the best interests of its inhabitants, it is important that it be often and intelligently discussed.

Our own political principles and traditions have ever been so strongly in favor of the widest possible individual liberty, and so strongly repugnant to official supervision or control of private business, that it is difficult to introduce new restrictions or meas-

ures which the modern conditions make absolutely necessary for the protection of the public from some of the dangers of to-day as well as it was protected a generation ago under the conditions then existing.

Then one family's filth would not interfere with the health of its neighbors as it does now, because the neighbors were not so numerous nor so near. Then it was not so easy to introduce diseased meat, because we knew where the cattle were fattened, how they came here, and who slaughtered them; now the consumer practically knows nothing about it; and so on to the end of a long list.

Again, science has taught us how to cope with some of the diseases which were most dreaded in previous centuries, such as small-pox, cholera, typhoid fever, etc., but to successfully battle with them we must use organized effort and have official aid. Science has told us much about the nature of several of the most fatal diseases which sometimes sweep in great epidemics, how they march and spread, and what weapons can be used to vanquish or check them. When it is so universally acknowledged that the application of science has so added to our material prosperity, added to our comforts and our products, revolutionized our industrial pursuits, our commerce, and our travel, it is simply the height of foolishness not to use it also in the beneficent work of lessening sickness and saving human life.

Mechanical invention and physical science have contributed to the material good of the rich and poor alike; they have probably added relatively more to the privileges and common comforts of the poor than to the rich, yet it seems to me that they have relatively increased the *power* of the rich more than of the poor, and particularly to the power of rich organizations. It is probable also that these same causes have added to the credulity of the masses in directions dangerous to health. Such wonders have been actually performed that the claims of quacks and pretenders are listened to as they would not be were it not for the positive and well-known achievements of genuine science. An examination of all the advertisements of any single day in this city will show that nearly all of the manufacturers or vendors of nostrums claiming to cure all the ills of flesh, and also of new kinds of food and drinks intended for personal or family use, pretend to found their claims on the teachings and discoveries of science. There is nothing in the accepted ethics of publishing or in law to prevent

statements in advertisements which every intelligent man believes to be false, but which nevertheless deceive the ignorant, and who suffer as a consequence, sometimes directly from the use of the article, sometimes from a feeling of false security against real dangers.

It is most certainly the duty of government to protect the weak from the oppression of the strong, the virtuous from the vicious, and especially to protect that class called the poor. It is this last class that suffers most from adulterated foods, unwholesome surroundings, and other unsanitary conditions, which can only be controlled or suppressed by official effort.

The rich can largely protect themselves by voluntary association and by their wider choice of locality for their homes. As before said, in many cities private associations exist to protect its members from adulterated foods and drinks, and it is only a question of time how long it will be before each State or city must provide some official means to also protect the public at large. As it now is, we have laws and officials to see to it that the grocer's and milkman's measures are correct, so that the buyer be not cheated in the quantity, but practically we have no means of preventing a worse cheating as to quality. We have laws and officials to see that the butcher's scales are correct, but practically no means of seeing that the meat he weighs is wholesome. We protect the pocket but neither health nor life in many such matters.

The need of sanitary inspectors has been brought to the attention of our city government from time to time, but the proposition has not yet met with favor. Their appointment, however, is but a question of time; they will as surely be demanded by the community to aid in suppressing disease as the police now is for the suppression of crime and violence, and the next generation will as surely smile at our opposition and ignorant conservatism as we do at a previous generation for opposing lighting by gas, vaccination, and lightning rods. For, after all, we must ultimately depend upon the general intelligence of the community. No amount of official supervision can take the place or do the work which belongs to each individual—it must merely supplement and aid it. If liberty be worth anything, it must be used for the public as well as for private good, and if the health of a city could be entirely regulated and saved by a *board*, of what use would be individual liberty?

The official health board then should certainly labor in at least four directions:

1st, To do that which the free individual cannot do in his private capacity to protect himself from unwholesome conditions which arise from his neighbors.

2d, To see that the conditions which produce or spread zymotic diseases are suppressed or controlled.

3d, To educate the public in sanitary matters, advise it of real dangers, and quiet fear as to imaginary ones.

4th, To protect the poor from those dangers to health which they are particularly subjected to.

SECRETARY'S REPORT.

The general character of the work of the year has been outlined in the preceding report, but before presenting detailed accounts of the different subjects there presented there are some more specialized labors and duties performed by different members of the Board, and by the Secretary, under direction and instruction of the Board, that require mention, in order to fully explain the work accomplished. The publications of the Board have already been alluded to as one of the methods of popularizing sanitary and hygienic principles; another method, which was mentioned in our first report, has been pursued as extensively as time would permit. That is by means of sanitary lectures, familiar talks, and discussions. A half or three-quarter hour lecture is given, generally followed by an informal discussion of the topics presented, or of others of local interest that may be brought forward. These have been well received and considerable interest manifested in the discussion of local sanitary questions. In another department Prof. Brewer has discussed sanitary subjects before farmers' conventions, and at the sessions of the State Board of Agriculture. These are of a more scientific character, and have been of the greatest value, in many instances involving the results of personal investigations.

This course will be continued, and in this manner much practical information disseminated, in a manner and method to render it of permanent benefit. Public hygiene has also received special attention at the Medical school, through the agency of Prof. Lindsley, so that the new coming doctors will be better rooted and grounded in this department than their predecessors. In connection with Prof. Northrop lectures have been delivered by the Secretary before village improvement societies, and on school hygiene before the different teachers' institutes in the State. A course has also been commenced at the Normal School, which is expected to be a yearly institution hereafter. The only limit to work in this department is time, as the demand and interest are unflagging. The results are, in many cases, direct and decided.

SANITARY INSPECTIONS AND INVESTIGATIONS.

In many cases inspection of houses and grounds have been made, with reference to their sanitary condition, and full and explicit directions given for placing the house and its surroundings in a proper sanitary condition. Examination of the water of wells and of sources of public water supply have also been repeatedly made. This work will always be performed whenever circumstances warrant, on due notice being given. It is intended to render the Board as directly beneficial to the people as possible, and whenever there is good reason to suppose that local unsanitary conditions exist, examination will be made. Investigations will also be made on the appearance of any unusual forms of disease, upon notification of their existence.

ILLUSTRATION OF THE APPARENT CAUSATION OF MALARIAL FEVER.

There were a number of cases of malarial fever in a limited locality in Durham, where no cases had previously been known, except from importation, and these were succeeded by severe cases of typho-malarial fever, no other cases existing in the town. A large swamp had been flooded the season previous to the outbreak of the first cases, and as all the cases were around this pond it was suspected as a cause. On examination there was found a depth of water not exceeding three feet in the deepest portion, and allowing the sun to strike through to the vegetation, which was covered with shallow water for the most part. Some fifty acres were thus flooded by a dam not over four feet high at any portion. The water was set back in the swamps for a considerable distance. The connection between this condition of affairs and the causation of malarial fever seems evident.

SCAVANGERING, OR DISPOSAL OF FILTH AND GARBAGE OF TOWNS AND CITIES.

This includes the removal of ashes and dry house-dirt, cleaning streets and catch-basins, and the removal of offal. The system in use at Boston, Mass., is very thorough; a condensed outline of the plan is here given. Greater attention to this important subject is earnestly recommended to cities and towns; next to sewerage there is no subject that will better repay intelligent management in the interests of public health. The ultimate disposal of this filth is, too, a question of the deepest importance in a sanitary

sense. The whole matter is under advisement by the Board, and we hope soon to issue a circular of instruction. The use of street-scrapings to mend other places where the streets are defective, or to spread in a layer over the fine stones in macadamized roads, cannot too strongly be condemned. Malaria is more than invited by this process, and the evils of a filth-saturated soil are kindly disseminated. The ultimate results of an accumulated thickness of such a material in a roadway and a protracted heated term are a pestilence or epidemic; it is simply a question of time.

The filth to be removed by scavangering is of two general kinds—ashes and dry house-dirt, and garbage or offal. These should be kept apart, and separately collected and removed, and a stringent fine imposed by municipal or town law if they are not kept separate. Each householder should be compelled to keep a water-tight and properly covered receptacle for house-garbage. These receptacles should be emptied by a city cart, which should be water-tight, and removed beyond the city limits. There would be no difficulty in disposing of this matter; the city of Boston sells this for $28,000, and it costs $76,000 to remove it in the manner described. It is urgently advised that a regular garbage removal should be provided for in cities and towns, and the ashes and dry dirt be kept separate from the garbage. The street-scrapings are best disposed of to farmers, who would doubtless remove them for their value as fertilizers.

The ashes and dry dirt may be used in filling and grading; they should be as regularly removed as the garbage, and not allowed to accumulate. In spite of all care, garbage and decaying matter, especially dead animals—rats, cats, dogs, etc.,—will be mixed with the dry refuse, so that this material is unfit for filling ground to be used for the sites of houses. Decomposition goes on in this material for years, and extensive epidemics have been caused in houses built over land made by refuse. The removal of garbage, house refuse, street-scrapings, the contents of catch-basins and cesspools can be more readily secured than a satisfactory disposition of them. In this State, however, farming lands are so near the cities that they can be pretty well disposed of there. The contents of catch-basins, street-scrapings, dead animals, and the contents of cesspools, should be used as fertilizers on farms, and never in filling in. Too much carelessness is exhibited here, especially where ponds or shallows are to be filled; everything is there dumped, and a thin covering of ashes expected to answer all

sanitary requirements. The attention of local boards of health is respectfully directed to this matter. The epidemic of 1878 in New Orleans has effectually prevented the use of street-scrapings, and the mixture of offal and refuse above described, so far as that city is concerned. It is to be hoped that we will not in Connecticut wait for the epidemic we have in too many cases been assiduously inviting, carefully cultivating all the conditions; but in the future follow rational sanitary methods. Even if some outlay is involved, it cannot be more wisely expended.

A word as to the time for cleansing vaults. The day is far preferable; the odors stirred up at night in the still air remain, and cannot be excluded from sleeping apartments, and directly produce disease. In a sanitary point of view, the night should never be used to clean a privy-vault.

SLAUGHTER-HOUSES.

The attention of local boards of health is directed to these establishments; they should be excluded from city limits, unless the modern methods of disposal of refuse are enforced. By these, these establishments can be rendered as inoffensive as any other. A general law regulating noxious trades and industries is required, as nearly all can be so regulated that no danger to the health of the neighborhood will be caused. The exceptional cases should be removed to a distance from populous places.

SANITARY PUBLICATIONS.

One of the most important departments of labor engaged in by the Board is the publication of short, concise, and plain circulars or pamphlets on some hygienic subject, or giving exact and plain directions with regard to the prevention of disease. That on diphtheria, one of the first issued, has had a wide circulation, has met with general favor, and has been, in many cases, of great usefulness. It has received unqualified approbation from other Boards, and, in one or two instances, has been used as a basis for a similar publication. It is kept in stock and freely circulated whenever demanded. It is also sent at once where an outbreak of the disease occurs, to those likely to be interested,—school officers, and the like. Such publications receive much more attention when the disease on which they treat is actually present than at other times.

This year the circular on "treatment of the drowned" has been published, and as there has not been much time to accumulate experience on the subject, the circular of the Michigan State Board of Health was adopted. The Secretary, Dr. Baker, very kindly furnished the cuts to print from, thus saving us the expense. This has been partially circulated, and is now in stock. It is printed in two forms,—one on thick card-board, large size, for posting conspicuously in public places; the other of the right size to be carried in one's pocket memorandum book. This has also been very favorably received, and promises to be of usefulness.

TREATMENT OF THE DROWNED—TWO THINGS TO BE DONE: RESTORE BREATHING; RESTORE ANIMAL HEAT.

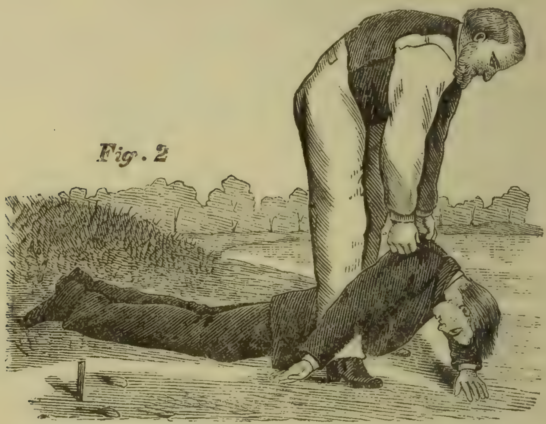
RULE 1. Remove all obstructions to breathing. Instantly loosen or cut apart all neck and waist bands; turn the patient on his face, with the head down hill; stand astride the hips with your face towards his head, and locking your fingers together under his belly, raise the body as high as you can without lifting the forehead off the ground (Fig. 1), and give body a smart jerk to remove mucus from the throat and water from the windpipe; hold the body suspended long enough to slowly count ONE, TWO, THREE, FOUR, FIVE, repeating the jerk more gently two or three times.


Fig 1.

RULE. 2. Place the patient face downward, and, maintaining all the while your position astride the body, grasp the points of the shoulders by the clothing, or, if the body is naked, thrust your fingers into the armpits, clasping your thumbs over the points of the shoulders, and raise the chest as high as you can (Fig. 2) with-

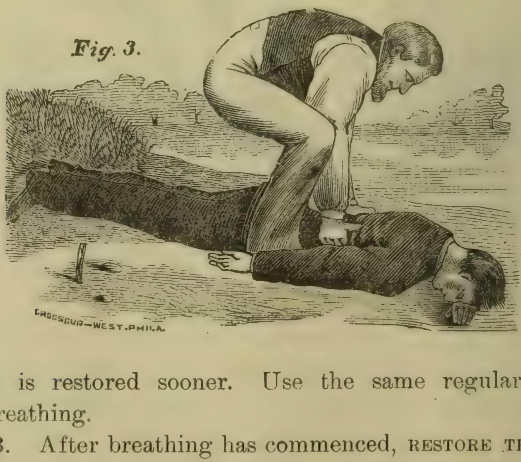
out lifting the head quite off the ground, and hold it long enough to *slowly* count ONE, TWO, THREE. Replace him on the ground, with his forehead on his flexed arm, the neck straightened out, and the nose and mouth free. Place your elbows against your knees and your hands upon the sides of his chest (Fig. 3) over the lower

Fig. 2



ribs, and press downward and inward with increasing force long enough to slowly count ONE, TWO. The suddenly let go, grasp the shoulders as before, and raise the chest (Fig. 2); then press upon the ribs, &c. (Fig. 3). These alternate movements should be repeated ten to fifteen times a minute for an hour at least, unless

Fig. 3.



breathing is restored sooner. Use the same regularity as in natural breathing.

RULE 3. After breathing has commenced, RESTORE THE ANIMAL

HEAT. Wrap him in warm blankets, apply bottles of hot water, hot bricks, or anything to restore heat. *Warm the head nearly as fast as the body, lest convulsions come on.* Rubbing the body with warm cloths or the hand, and slapping the fleshy parts may assist to restore warmth, and the breathing also. If the patient can SURELY swallow, give hot coffee, tea, milk, or a little hot sling. Give spirits sparingly, lest they produce depression. Place the patient in a warm bed, and give him plenty of fresh air; keep him quiet.

BEWARE !

AVOID DELAY. A MOMENT may turn the scale for life or death. Dry ground, shelter, warmth, stimulants, etc., at this moment are nothing; ARTIFICIAL BREATHING IS EVERYTHING,—is the ONE REMEDY; all others are secondary.

Do not stop to remove wet clothing before efforts are made to restore breathing. Precious time is wasted, and the patient may be fatally chilled by the exposure of the naked body, even in the summer. Give all your attention and effort to restore breathing by forcing air into and out of the lungs. If the breathing has just ceased, a smart slap on the face, or a vigorous twist of the hair will sometimes start it again, and may be tried incidentally, as may also pressing the finger upon the root of the tongue.

Before natural breathing is fully restored, do not let the patient lie on his back unless some person holds the tongue forward. The tongue, by falling back, may close the windpipe, and cause fatal choking.

If several persons are present, one may hold the head steady, keeping the neck nearly straight; others may remove wet clothing, replacing at once clothing which is dry and warm; they may also chafe the limbs, and thus promote the circulation.

Prevent friends from crowding around the patient and excluding fresh air; also from trying to give stimulants before the patient can swallow. The first causes suffocation; the second, fatal choking.

DO NOT GIVE UP TOO SOON. You are working for life. Any time within two hours you may be on the very threshold of success without there being any sign of it.

In suffocation by smoke or any poisonous gas, as also by hanging, proceed the same as for drowning, omitting effort to expel water, etc., from the windpipe.

In suspended breathing from effects of chloroform, hydrate of chloral, etc., proceed by Rule 2, taking especial pains to keep the head very low, and preventing closure of the windpipe by the tongue falling back.

The foregoing method, originally published by the State Board of Health of Michigan, has the sanction of other State and City Boards of Health, and is fully endorsed by the State Board of Health of Connecticut, and printed for general distribution as a life-saving measure.

Address State Board of Health, Hartford.

The last circular, just issued, is on rural hygiene, with reference especially to the house and its surroundings. There is so much to be said on this topic that it is extremely difficult to condense and select the most salient points. Those have been taken for the most part that, in the experience of the members of the Board, in personal investigations, need most to be elucidated and understood. Many unsanitary conditions about the house are allowed to exist which would not be tolerated if their nature and effects were understood. Too great confidence is placed in country air.

It must be remembered that by the waste and excrementitious filth necessarily resulting from human and animal life, the immediate surroundings of a house, air, soil, and water may be poisoned even in the best selected location, and that carelessness or ignorance of the laws of drainage may give one a damp, cold, and wet site, where the appearances would lead one to expect the contrary, and thus entail all the evils that a wet subsoil slowly but surely induces.

SUGGESTIONS ON RURAL HYGIENE.

Relating principally to the House and its Surroundings.

A dry, well-drained site for a dwelling-house is pretty generally conceded to be an essential requisite for a healthy home. The relation of damp, sodden foundations and wet, undrained surroundings to such diseases as rheumatism, diarrhœa, and consumption is recognized by nearly all intelligent persons, the facts relative to the latter disease having been demonstrated chiefly by Dr. H. I. Bowditch, of the Massachusetts State Board of Health.

But while the necessity for the removal of the excess of surface moisture has become a matter of general information, the reverse is true with reference to deep drainage, which is not so well understood even by physicians.

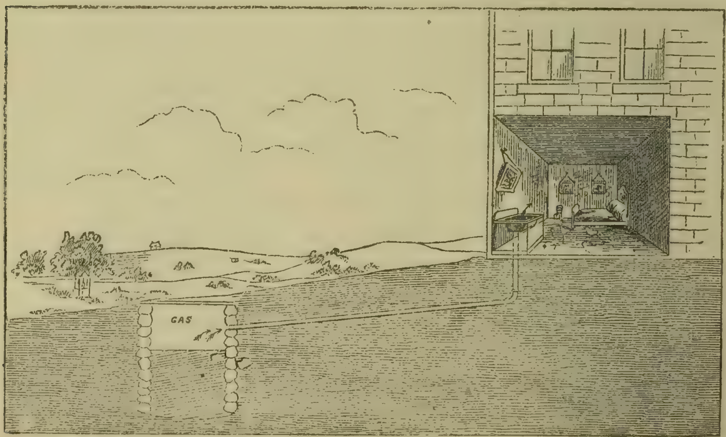
At a level, varying with the geological formation from a few feet to several hundred below the surface of the ground, we find the soil saturated, so to speak, with water. This may be considered as a sheet of water moving toward the sea with a slow but uniform motion, and feeding rivers and other water-courses perhaps as much as the brooks or streams which flow in upon the surface. This underground circulation of water is called subsoil or ground water. The latter term will be used in this circular. The level of the ground water at a river would be about the same as the bed of the river, gradually rising as you recede from the banks. Deep wells reach the level of the ground water, and their uniform level is a fair gauge of the level of the ground water. Retention of the ground water by natural or artificial means is one of the most fruitful sources of malarial diseases, which disappear when a free outflow is provided. One of the most striking examples in this country was furnished by the city of Detroit, where the mortality from epidemics of malignant malarial fevers was excessive, and epidemic dysentery and cholera prevalent, now one of the healthiest cities in the world,—the results of a complete system of drainage and abundant supply of pure water, although naturally most unfavorably located.

A house upon a sandy hillside may be malarious, so to speak, or a hot-bed of consumption, while one near a stream or upon low land may be dry and healthy. In the one case the outflow of the ground water is obstructed, while in the latter entirely free and unimpeded. The unhealthfulness of many an apparently well located dwelling is thus accounted for. It is evident that in many instances town or even State action is requisite to secure deep drainage. In constructing a house, deep drains should be carried under the foundation walls entirely around the house, with one or more branches from the center of the cellar. These should in no case be used for sewage. Systematic drainage by towns will of necessity receive more attention as the causal relation of retained ground water to malarial and other forms of disease is recognized.

The atmosphere does not end with the surface of the ground, but fills the spaces between the particles of the soil unless displaced by other gases or water, and plays an important part in the chemistry of plant life; but as in the case of the ground water, the ground air, as it is called, is considered here only in its sanitary relations.

The soil about country homes may be contaminated by soakage

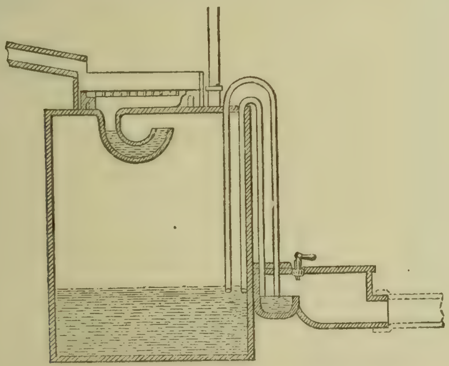
from leaky cesspools and privy vaults, and from decaying heaps of garbage and filth. The contamination of the ground air that results is more deleterious to health than the vile odors that may render the air disagreeable, but which are not particularly harmful. A house standing upon a gravelly foundation rests upon two-thirds small stones, one-third air. Now, as in this climate the houses are warmed a great part of the time, they act upon the same principle as a chimney, and suck up or draw in this ground air, which is colder than the air of the house, and influence thus a considerable area. Now, if the air, contaminated by contact with a soil polluted by kitchen or chamber slops, soakage from privy vault or cesspool, or any decaying mass or accumulation of filth in outhouses or surroundings is drawn into the house, as must of necessity happen if such sources of pollution exist, the air of the house is to this extent contaminated and devitalized, and becomes the predisposing cause of such diseases as diphtheria, cholera infantum, croup, catarrh, lung fever, consumption, and a host of minor ills that depress vital energy, lessen the working power, and shorten life. The products of decay from vegetable putrefaction in the cellar are by the same law of natural philosophy drawn up to devitalize the air of the occupied rooms.



One of the most common sanitary defects is illustrated in the above cut. A closed, unventilated cesspool communicates by an open, untrapped pipe directly with the house, so that all the gases of decay generated in the cesspool find their only outlet in the

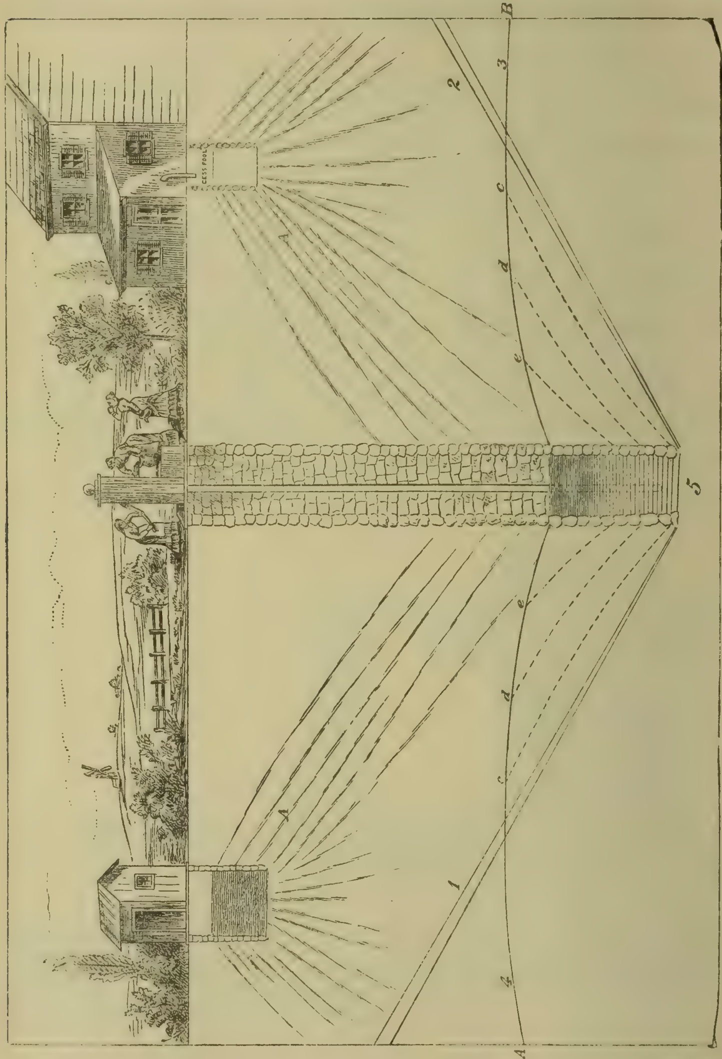
house. and are also drawn in by the difference in temperature already described. In other words, the house is used to ventilate the cesspool. In the instance from which this sketch was taken, the apparent result was the death of five children from diphtheria; three slept in a room adjacent, with the door open at night, two in the room above.

If cesspools are used they should be cemented water tight, ventilated thoroughly, and frequently emptied. The soil saturation resulting from ordinary careless methods sooner or later becomes a factor in the production of disease. The best method in a sanitary point of view is the absorption method. A series of porous tiles are laid a few inches below the surface, preferably of a lawn. These communicate with a flush tank, which empties itself automatically as soon as full with sufficient force to flush the pipes. This system has stood the test of time, and is well adapted for the sewerage of small towns where there is no water supply. The following cut illustrates the tank mentioned. If it is desired to irrigate different plots, the tank can be connected successively with each set of drain pipes.



It is hardly possible to fix the limit for perfect safety for the distance that should exist between privy vault, cesspool, and well. It is safe to say that, if used at ordinary distances, both vault and cesspool should be cemented water-tight. The principles of drainage are practically recognized by every farmer, almost, who learns by experience that a drain draws from a larger area after it has been in place awhile, and that channels of communication are formed in the soil along which the water finds its way to the drain.

Still it is seldom that they apply this to their wells, and we find outhouses situated within a few feet of wells, and the cesspool perhaps as near on the other side. A common error in this con-



nection is to conclude that, if the water from a well is clear, bright, and sparkling, and offends neither taste, sight, or smell, that it

must be pure. The reverse, however, is the case, and water that is the most decidedly contaminated by the products of organic decay may be the most pleasant to sight and taste. Indeed, such water is often sought for its pleasant qualities, as was the case with the famous Broad street well in London, which communicated cholera to so many persons. The accompanying illustration shows pollution of soil and water by cesspool and privy vault. The lines 1, 5, 2, 5 outline the drainage area of the well, which in this case includes both vault and cesspool. The line A, B indicates the level of the ground water, and the dotted lines show the local curves that would result in the level of the ground water if the well were drawn down.

The driven well, if driven deep enough, avoids contamination by surface water. The water from deep wells, when not contaminated by surface water, is of the best possible quality. Surface water may be excluded by laying the upper three-fourths of the wall of the well in cement.

Infiltration of the soil from the privy-vault may be prevented by cementing the vault so as to be water-tight. The earth closet system is to be unqualifiedly commended, and any one with the slightest ingenuity can construct one that will answer all requirements. An ordinary packing box and a large-sized coal hod furnish the requisite materials. If dry earth be not readily obtainable, ashes will serve equally as well. A corner of the box may be partitioned off to hold the earth or ashes, a seat and cover can be easily made, and for all practical purposes the result is equal to that achieved by the outlay of twenty-five to thirty dollars. The advantages and comfort of this system, especially in the winter months, for women and children, more than outweigh any slight trouble that may be involved. The pail system is well adapted for small towns where sewerage or the flush tank system are out of the question. If a general system for the disposal of this and other forms of filth cannot be made general throughout the town or village, a sanitary association or village improvement society might inaugurate the system, which, once started, would thenceforth be self-sustaining.

Excessive shading of house and grounds is not uncommon, and while shade trees add much to the attractiveness of a town or village, dense shading of the grounds or house induces dampness, and produces ill health by the exclusion of sunlight. The soil is often kept damp and unwholesome, and a constant decay of leaves

and other vegetable substances near dwellings, by dense shrubbery. Fresh air and sunlight should have the fullest access to all the immediate surroundings of the house. In a sanitary view the elm, with its more open habit, is the better shade tree for streets and yards. Human beings require sunlight as well as plants. In the back yards, near the neglected sink drain, a rank, nauseous vegetation too often exists, and a damp, filth saturated soil.

If disinfectants are to be used, the best are copperas or sulphate of iron for privy vaults, garbage heaps, and the like, and a solution of the sulphate or chloride of zinc for cesspools and sink drains. The prompt removal of all filth before decay commences is the sanitary method. But as this cannot always be secured, disinfectants must be sometimes used;—those mentioned as cheap, odorless, and efficient. Where the soil is saturated with grease or oil, the preliminary use of caustic potash may be requisite.

A saturated solution of copperas may be used,—that is, as much as the water will dissolve. From eight to ten ounces of the zinc salts to a gallon of water is a good solution. The chloride of zinc is strongly caustic ; in strong solutions the salts may be used separately or together.

A circular on school hygiene is in course of preparation, and one on the sewerage and drainage of city houses. As circumstances demand, and time and funds allow, we hope to cover the field of the more important points involved in public hygiene.

In the department of vital statistics a resumé of the laws concerning marriage and the duties of registrars and of those solemnizing marriages has been published, and partially circulated. It is sent with each supply of blanks that are ordered, and will be until all towns are supplied, and then kept in stock for special needs. It will be found in proper place, following the registration tables. A similar circular relating to the returns of births and deaths will be issued during the next year.

Our system of blanks for the department of vital statistics is now about complete ; with an admirable basis to start upon, the additions have been for the most part those relating to the sanitary work of the Board. In a visit of inspection the blanks met the unqualified approbation of Dr. Elisha Harris of New York, one of the highest authorities in the department of vital statistics.

DISINFECTION AND DISINFECTANTS.

For all practical purposes the disinfectants most to be relied upon are copperas, the salts of zinc, the sulphate and chloride especially, and sulphur. Copperas may be used for privy vaults, cesspools, garbage heaps and the like, the salts of zinc for sewage, and in solution to disinfect cotton and linen goods used about the sick. There are other disinfectants of value, but these are inodorous, efficient, and easily handled. Their value has been demonstrated in the experience of the National Board of Health, the Auxiliary Sanitary Association of New Orleans, and of the New York Board of Health, as well as other organizations. Solutions of the zinc salts may also be used. The following instructions have been issued by the National Board of Health :

INSTRUCTIONS FOR DISINFECTION.

PREPARED FOR THE NATIONAL BOARD OF HEALTH.

Disinfection is the destruction of the poisons of infectious and contagious diseases.

Deodorizers, or substances which destroy smells, are not necessarily disinfectants, and disinfectants do not necessarily have an odor.

Disinfection cannot compensate for want of cleanliness nor of ventilation.

I.—DISINFECTANTS TO BE EMPLOYED.

1. Roll sulphur (brimstone) for fumigation.
2. Sulphate of iron (copperas) disolved in water in the proportion of one and a half pounds to the gallon—for soil, sewers, etc.
3. Sulphate of zinc and common salt, disolved together in water in the proportion of four ounces of sulphate and two ounces salt to the gallon—for clothing, bed-linen, etc.

NOTE.—Carbolic acid is not included in the above list for the following reasons : it is very difficult to determine the quality of the commercial article, and the purchaser can never be certain of securing it of proper strength ; it is expensive, when of good quality, and experience has shown that it must be employed in comparatively large quantities to be of any use ; it is liable by its strong odor to give a false sense of security.

II.—HOW TO USE DISINFECTANTS.

1. *In the Sick-room.*—The most available agents are fresh air and cleanliness. The clothing, towels, bed-linen, etc., should on removal from the patient, and before they are taken from the room, be placed in a pail or tub of the zinc solution, boiling hot, if possible.

All discharges should either be received in vessels containing copperas solution, or, when this is impracticable, should be immediately covered with copperas solution. All vessels used about the patient should be cleansed with the same solution.

Unnecessary furniture, especially that which is stuffed, carpets, and hangings, should, when possible, be removed from the room at the outset; otherwise they should remain for subsequent fumigation and treatment.

2. *Fumigation* with sulphur is the only practicable method for disinfecting the house. For this purpose the rooms to be disinfected must be vacated. Heavy clothing, blankets, bedding, and other articles which cannot be treated with zinc solution should be opened and exposed during fumigation, as directed below. Close the rooms as tightly as possible, place the sulphur in iron pans supported upon bricks placed in wash-tubs containing a little water, set it on fire by hot coals or with the aid of a spoonful of alcohol, and allow the room to remain closed for twenty-four hours. For a room about ten feet square, at least two pounds of sulphur should be used; for larger rooms proportionally increased quantities.

3. *Premises.*—Cellars, yards, stables, gutters, privies, cesspools, water-closets, drains, sewers, etc., should be frequently and liberally treated with copperas solution. The copperas solution is easily prepared by hanging a basket containing about sixty pounds of copperas in a barrel of water.

4. *Body and Bed-Clothing, etc.*—It is *best* to burn all articles which have been in contact with persons sick with contagious or infectious diseases. Articles too valuable to be destroyed should be treated as follows:

(*a*) Cotton, linen, flannels, blankets, etc., should be treated with the boiling-hot zinc solution; introduce piece by piece, secure thorough wetting, and boil for at least half an hour.

(*b*) Heavy woollen clothing, silks, furs, stuffed bed-covers, beds, and other articles which cannot be treated with the zinc solution should be hung in the room during fumigation, their surfaces thoroughly exposed, and pockets turned inside out. Afterwards they

should be hung in the open air, beaten and shaken. Pillows, beds, stuffed mattresses, upholstered furniture, etc., should be cut open, the contents spread out and thoroughly fumigated. Carpets are best fumigated on the floor, but should afterward be removed to the open air and thoroughly beaten.

5. *Corpses* should be thoroughly washed with a zinc solution of double strength; should then be wrapped in a sheet, wet with the zinc solution, and buried at once.

Metallic, metal-lined, or air-tight coffins should be used when possible; certainly when the body is to be transported for any considerable distance.

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DOMESTIC POISONS.

The cases of poisoning by a variety of fabrics and utensils in domestic use, if all were known and fully investigated, would excite sufficient attention to secure legislative action, to say the least. So fatal have been the effects, and so clear the connection between poisonous coloring matter used in candies and the results, that the use of the more active poisons has been about discontinued in their manufacture, and the principal adulterant now used is terra alba, which does not kill, but only produces dyspepsia and minor ills. Unhealthful coloring matters are still used, but the more deadly have been discarded.

Lead and zinc are often used so that vegetable and fruit acids disolve them in directly harmful proportions. A variety of granite ware was found to contain soluble lead. If rightly manufactured, although lead is used it is rendered insoluble and therefore harmless. Canned meats were found contaminated by lead used in the solder. As stated before, little danger is now to be apprehended from either of these sources, but the carelessness of manufacturers of articles in domestic use in the handling of poisons borders on the marvelous. Their confidence in the protecting powers of Providence or some other agency is apparently unbounded.

One of the most striking illustrations was brought to the attention of the Board resulting from poisoning from aniline dyes. A

blue veil worn once caused an extensive and well nigh fatal eruption of the face, lasting for months, producing most distressing as well as dangerous effects. The mouth, tongue, and throat were involved as well as the face, as often in arsenical poisoning. The eruption caused great pain, was accompanied by swelling of the face and discharge, intolerance of light, and weakened sight for a long time after convalescence was established.

The veil on examination was found to be colored by a poorly made aniline dye. When placed in water it readily yielded up its coloring matter; this on examination was found to be aniline containing a large percentage of arsenic. Arsenic is used largely in the manufacture of aniline dyes, but if properly made nearly all is removed, and the small quantity remaining is fixed—that is, rendered insoluble. In this case the arsenic was not removed to any great extent, nor was it rendered at all insoluble. The use of a dye containing so large a percentage of arsenic in so readily soluble a form should be punishable by a heavy fine, to say the least. This is the most aggravated case we have known. Several minor cases from the use of the same class of dyes used to color flannels and stockings have been brought to our notice, but in these cases the neglect was in fixing—that is, rendering insoluble—the small quantity of arsenic that remains when the manufacture of the dye is completed. In the case of the veil, however, the large percentage of arsenic used in manufacture was not removed, neither was there any effort made to render it insoluble. A test, therefore, of the worst type of these dyes would be their solubility in water. The eruptions they produce are well marked, painful, and quite lasting. We have seen no fatal cases; that induced by the veil was very nearly fatal.

The effect produced by arsenical wall papers is now pretty well understood, so that the market for the sale of bright greens and the like tints is not very good; still arsenical dyes are used in papers not so readily recognized by the public; some white papers are as heavily loaded as the green, and dull greens are as dangerous as the bright. Dr. Taylor of London, an authority in medical jurisprudence, states, "The pigment of arsenicated wall papers contains a large proportion of arsenic, and from some of these papers in the unglazed state the noxious material may be easily scraped or removed by slight friction; thus arsenic is liable to be distributed through the air of the room in the state of fine dust." Workmen who hang these papers often suffer from chronic arsenical poison

ing. "Green arsenical lamp-shades have doubtless caused headaches, irritation of the eyes, and other symptoms that have been attributed to the use of coal gas, but the mischief was no doubt due to the arsenic in the shades."

A very obscure case, which was obstinate and failed to yield to the usual remedies was thus caused. The symptoms were severe, burning pains in the stomach, nausea, headache, alternate constipation and diarrhœa, loss of appetite, excessive thirst, nervous twitchings, shortness of breath. As soon as she was removed from her work these symptoms disappeared, to return as soon as her employment was resumed. The case was discovered to be one of chronic arsenical poisoning. Her employment was to put bright green bands around packs of envelopes. The end of the band was gummed, and in moistening this with the tongue enough arsenic was absorbed to produce the symptoms described. She was supplied with a sponge and no further trouble ensued. Experience in the envelope works in Hartford has demonstrated the necessity of care in handling the bright green arsenicated paper.

Poisoning from the manufacture of artificial flowers used in millinery has repeatedly occurred, and several deaths and untold suffering have been thus caused. It would almost seem justifiable to prohibit the use of arsenic altogether in domestic fabrics of all kinds, even at the sacrifice of some bright tints and colors. In the case of aniline dyes they are all manufactured by the aid of arsenic—mauve, scarlet, and bronze, as well as green; and unless it is rendered insoluble harm may result. Gloves, veils, stockings, flannels, and woolen goods generally, in fact anything worn next the skin, should not have soluble or readily soluble coloring material. The following was lately reported by Dr. Geo. A. Rees to the London *Times:* "I have had occasion more than once to bring cases before the notice of the medical profession in which severe symptoms were experienced by patients who were being slowly poisoned by arsenic. This slow poisoning is going on at present very extensively. I have described a sad instance of poisoning by an arsenicated coloring matter contained in the green calico lining of some bed curtains. For months and months this source of poison was not discovered, and the symptoms were treated as those of natural disease. On the removal of the curtains the patient at once regained her health. There is another source of arsenical poisoning of which I have only lately been informed. It exists in the coloring matter of a green muslin much used for

ladies' dresses. Dr. Debus, our Professor of Chemistry, who examined the curtain lining before mentioned, suspecting this, purchased a specimen for analysis. It proved to contain upwards of sixty grains of an arsenical compound in every square yard, and so slightly incorporated that it could be dusted out with great facility."

The examples in England of fatal effects from the use of violet powder containing arsenic were widely published, and show how readily arsenic can be absorbed through the skin. I have been largely indebted in presenting this subject to a little work by Henry Carr of London, Eng., on our domestic poisons, to which the reader is referred who wishes further illustrations of the use of arsenic and aniline carelessly and the evils that ensue. The quotations are from that excellent little work. The cases related were brought directly to the attention of the Board.

THE SEWERAGE OF LITCHFIELD.

The following brief account of the sewerage of Litchfield is given in order to record one of the important sanitary movements of the year, and for the benefit of other towns that may be contem-

plating similar work. The introduction of a public water supply and of a system of sewers should be as simultaneous as possible. With the use of Field's flush tank, illustrated in the circular on drainage, the sewers can be flushed even if there be no general water supply.

The sewer in this case drains all cellars and sinks of the district through which it passes. The laterals connected with the houses are flushed by cistern overflow; these are all trapped. The main sewer is flushed by water from the court house roof discharging into a flush tank, which works automatically. The main sewer is about a quarter of a mile long and has a fall of thirty-five feet. I am indebted to Dr. Deming for this account of the sewerage system.

LOCAL HEALTH BOARDS.

Consultations with different local organizations have been frequent during the year. The use of small streams for the disposal of sewage has several times been brought to the attention of the Board in this way. This is a more or less common sanitary nuisance—a small brook is made the receptacle of house drainage, or contaminated by direct sewer discharge, until the volume of filth it receives is so great that the brook becomes in fact an elongated cesspool. The brooks thus used become a standing menace to the health of the neighborhood, and are accompanied by an undue prevalence of zymotic disease in the region surrounding. Radical measures for the relief of such conditions have resulted, in several instances, from the attention that has been directed to them. In many cases these are suffered to exist from simple negligence. The condition of the brook is a matter of gradual growth, and it thus escapes attention until it reaches considerable magnitude and becomes directly prejudicial to health. In the now historic instance of Over Darwen, more than a hundred deaths were caused from contamination of the water main by infiltration through the soil of the excretions of a typhoid fever patient. More recently, at Caterham and Redhill, twenty-one deaths were caused by pollution of the water supply by typhoid excretions. The danger of using small brooks as sewers becomes apparent, as they often run within communicating distance of wells, and thus the excretions from typhoid fever patients might find their way into drinking water.

The following account of an epidemic of diphtheria in Groveton, New Hampshire, is too instructive to let pass. There were 114 cases, fourteen fatal. The center of the infection was the schoolhouse; this was situated twenty rods back of a mill-pond and at the foot of a small mountain. One of the brooks had been dammed by the boys and its current turned, so that in rainy weather it ran under the school, leaving at other times a stagnant pool. A boggy meadow was near the school-house; privies which had

not been cleaned for two years overhung this. At the head of the pond was a saw-mill and tannery; the sawdust and tannery refuse were thrown into the pond. This pond was drawn down to repair the dam, and often filled at night and emptied during the day. An intolerable stench was caused; twenty-two cases of diphtheria among the scholars broke out in thirty-six hours; the disease soon became general. The village was located in the adjacent valley. There was no diphtheria near, nor no visitors to or from infected places. The disease arose apparently *de novo* from filth. Its simultaneous appearance in widely separated places forbade the idea of contagion. Typhoid fever succeeded the diphtheria; but when the pond was kept full, the disease disappeared. (Reported by Dr. Watson of Groveton.)

It is not enough to secure a supply of pure well-water. Care must be taken to keep it pure and prevent the access of foul drainage.

The construction of reservoirs for the storage of a public water supply, and the nature of the water-shed best adapted for the collection of drinking water, has been brought before the Board, in consultation with local organizations. Wherever uncultivated land can be obtained for a reservoir, it is preferable; nor is a peat bottom objectionable if the water is of sufficient depth over it. The only objection to water collected from a peaty soil is the coloration, and this does not result from organic contamination, that is, from products of decay. In case of a storage reservoir the coloration is soon removed by oxidation. In case of a distributing reservoir a peaty bottom is decidedly objectionable.

All decaying vegetable materials should be removed, and the soil for several feet from underneath old buildings, haystacks, in fine, in any case where soil infiltration may have ensued from use of the soil for building sites or storage purposes. The effects of soil contamination are beginning to be understood.

The adulteration of foods has in a few instances been investigated. These are of three kinds: (1) Deleterious. (2) Fraudulent. (3) Accidental. The first are substances directly injurious to health; the second are simply for purposes of gain, and are far more common, as the substitution of glucose for cane syrup, a substance not harmful but containing much less saccharine qualities and of inferior value; Indian meal in mustard is another familiar example. Some work in this department has been done during the year, but a more systematic study is planned for

the ensuing year. In connection with the examination of the sanitary qualities of drinking water, chemical examination of foods will be undertaken more extensively. Cream of tartar is one of the substances most frequently adulterated, but the worst substance added is terra alba, the same that is used in candy. Adulteration is not, however, so common as sometimes represented, and is, as before stated, oftener for the purpose of passing off an inferior article for one of greater intrinsic value.

Accidental impurities often are found that are incidental to the manufacture of the article, these are to be expected and are to be carefully distinguished from those added by design. So far as we can judge the most extensive mischief arises from the adulteration of milk, and doubtless a large percentage of the infantile mortality of large cities is due to the lack of nutritive qualities in milk whose standard has been lowered by the addition of some foreign substances. Water alone will not answer, as it lowers the specific gravity, and renders the vender liable to detection. The substances added are not hurtful in themselves, but the nutritive quality of the milk is diminished. The use of glucose for sugar, and the sale of adulterated or skimmed milk for the genuine article, are perhaps as common as any.

There is no satisfactory model to copy after in framing laws to prevent and control the adulterations of foods, drugs, and medicines. The English law is perhaps the best, but it does not, in practice, always work smoothly and efficiently. The chances for evasion are very great. During the ensuing year it is expected that our sanitary laboratory will be established for the examination of air, water, and food, if we can accumulate a satisfactory balance for obtaining the necessary appliances.

PROSPECTIVE SANITARY WORK.

The establishment of a complete Sanitary laboratory has already been alluded to. At present we are able to make qualitative chemcal examinations of drinking water, and microscopical examinations. The quantitative work has thus far been kindly performed at the Agricultural Experimental Station. The sanitary examinations of air, water, and food if made directly, would add a valuable feature to our work. We desire also to make arrangements for a systematic study of climatology and the meteorological conditions that influence health. The topography of the State in relation to local manifestations of disease is one important department that we

are now ready to study systematically. The results that await investigation in this field are of the greatest interest and importance. The investigation of local conditions offer opportunity for almost unlimited endeavor. The relations of climatology and meteorological conditions, however, should not longer be ignored. The lines of effort already established will be maintained as their apparent usefulness is constantly increasing.

The following additions have been made to the library of the Board during the year:

Hygiene and Public Health, Buck, 2 vols.
Latham Sanitary Engineering.
Sanitarian, Vol. 7.
Report Michigan State Board of Health, 1878.
Wanklyn Water Analysis.
3d Report Wisconsin State Board of Health.
1st " Rhode Island " " "
2d " Colorado " " " 1878.
" Louisiana " " " 1866.
" Minnesota " " "
Sanitary Record, 1879.
Denton, Sanitary Engineering.
McLagan, Germ Theory of Disease.
1st and 2d Reports New Jersey State Board of Health.
Blake, Sewage Poisoning.
Report on Diseases of Swine, Agricultural Department, Washington.
1st Report Commissioner of Health, Milwaukee.
Annual Report Board School Visitors, Hartford, 1878–9.
" " " " " Bridgeport, "
Adams, Railroad Accidents.
Teale, Dangers to Health.
Annual Report City of Meriden, 1879.
6th Registration Report, Michigan.
Plumber and Sanitary Engineer, 1879.
Transactions Boston Board of Health, 1876–78.
" New Haven Board of Health, 6 numbers.
Robinson Purification of Water.
Day on Ozone.
McKenzie on Diphtheria.
Field Sanitary By-Laws.

Blake, Croup and Diphtheria.
Virchow, Infectious Diseases.
Winslow, Spiritualistic Madness.
Public Health Report, 1877,* London.
Local Government Report, 1877, "
Rawlinson Sewage Disposal.
Report on Diphtheria in North of London.
Carr on Domestic Poisons.
Blythe's Practical Chemistry.
Scientific American Supplement, 1879.
Eggleston, Villages and Village Life.
Report School Visitor, Meriden, 1879.
Charter and Ordinances City of New Britain.
Annual Reports, 1877–78 " "
" " 1878, Hartford.
Report City Physician, Concord.
Proceedings Conn. Pharmaceutical Convention, 1878 and '79.
Report Health Department, Baltimore, 1878.
" " " Utica.
Report Water Commissioners, Hartford, 1878.
Ames' Odorless Excavating Apparatus.
Adams, The Public Library and Common School.
Northrop, Tree Planting, Lessons from European Schools.
6th Annual Report of the Local Government Board.
Report to Medical Officers of the Privy Council, 1876–77.
7th Annual Report of the Local Government Board.
Bowditch, Hygiene in America.
Calderwood, Relation of Brain and Mind.
Liebreich on School Life.
8th Annual Report of Local Government Board.
Manchester Health Lectures.
Fothergill, Maintenance of Health.
Timmins on Disinfection.
Erichson on Surgical Evidence.
Report of Committee on Hygiene of New York.
Richardson's Ministry of Health.
Varona, Sewer Gases.
Drysdale on Infectious Diseases.
Squibb on Adulteration of Food.
Somers on Children's Lives, How to Protect.
Manual of Nursing.

Parkes on Personal Care of Health.

Brown, Medical Register of New England.

Husband on Forensic Medicine.

Buchan on Care of the Sick.

Tidy Water Supply of London.

Morrison, Purification of Water Carried Sewage.

Report of Nashville Board of Health.

Report of Board of Education Connecticut, 1878–9.

Wilson, Summer and its Diseases.

Proceedings of Association of Medical Officers for Care of Idiotic and Feeble-minded Persons.

Sanitary Protection Association of Newport.

Address before Citizen's Auxiliary Sanitary Association, Nashville.

Reports and Papers before New Orleans Auxiliary Sanitary Association.

National Board of Health Bulletin.

Waring, Excremental Diseases.

Dr. Hart, Practical Hygiene.

Waring, Causation of Enteric Fever.

Jenkins, Healthy Homes.

Stephenson, The Fight With Infection.

Browne, Hygiene of the Voice.

Report of the Health Officer for San Francisco.

Nathan Allen, Lecture on the Education of Girls.

Report of Committee on Public Health, Relative to Lunatic Asylums, courtesy of Hon. A. T. Goodwin, N. Y.

Bartholomew, Address on Necessity of Educating the Public in the Principles of Medicine.

9th Report of the City Registrar of Albany, N. Y.

Derby on Anthracite.

Trans. American Medical Association, 2 vols.

Letheby on Foods.

C. W. CHAMBERLAIN.

TREASURER'S REPORT.

Expenditures from Dec. 1, 1878, to Dec. 1, 1879, -	$1,738.48
Salary of Secretary, - - - - - -	1,000.00
Total, - - - - - -	$2,738.48
Cash on deposit, - - - - - -	464.95
	$3,203.43
Bills outstanding, about - - -	$250.00

RECEIPTS.

Cash, - - - - - - -	$3,000.00
Balance from old account, - - - -	203.43
	$3,203.43

TOTAL EXPENSES OF THE BOARD SINCE ITS ORGANIZATION, JULY, 1878.

Cash expended, - - - - -	$3,285.05
Cash received, - - - - -	3,750.00
Balance on hand, - - - - -	$464.95

C. W. CHAMBERLAIN, M.D.,
Treasurer.

Approved.

C. A. LINDSLEY, M.D.
Auditor.

GENERAL STATEMENT OF EXPENSES.

Salary of Secretary,	$1,000.00
Blanks and Record books for Vital Statistics,	875.17
Sanitary Engineers,	378.00
Traveling expenses,	140.75
Photo-Lithograph Company,	99.90
Library,	138.00
Postage and express,	48.87
Incidentals,	21.75
Stationery,	36.04
Total,	$2,738.48

Books for town records of vital statistics form a larger element in the expenses of the Board than will ever be likely to occur in any one year again ; between five and six hundred dollars are called for by that item alone. The expenses for certificates of births, marriages, and deaths are proportionately larger, as a general supply was called for as a necessary result of a change in the forms. Like expenses will not again be incurred. so that we shall have more funds directly available for sanitary investigation and work. We have made it a rule to keep a working balance in the treasury in case of the outbreak of any epidemic, as without the "sinews of war" we should be powerless to accomplish anything even in the face of the greatest danger. Our thanks are due to the zealous laborers who have given time and effort so freely to aid our work. As an example, the location of every case of diphtheria in Bridgeport for two years was verified by Dr. Wordin, in the construction of the map published in our last report, yet the only reward was the consciousness of work well done. Almost invariably we find all classes of persons willing to aid us in all possible ways. The topographical work that requires to be done to elucidate the local conditions influencing disease, and the study of climatology and meteorological conditions, demand attention as soon as means are available.

REPORTS

OF

SPECIAL COMMITTEES.

ON THE SEWERAGE OF INLAND CITIES,

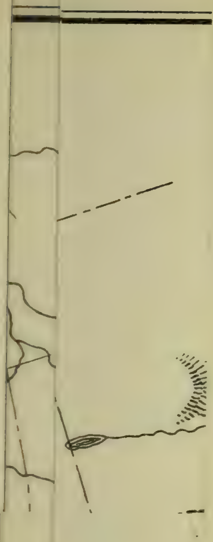
DR. C. A. LINDSLEY,
PROF. W. H. BREWER,
DR. C. W. CHAMBERLAIN.

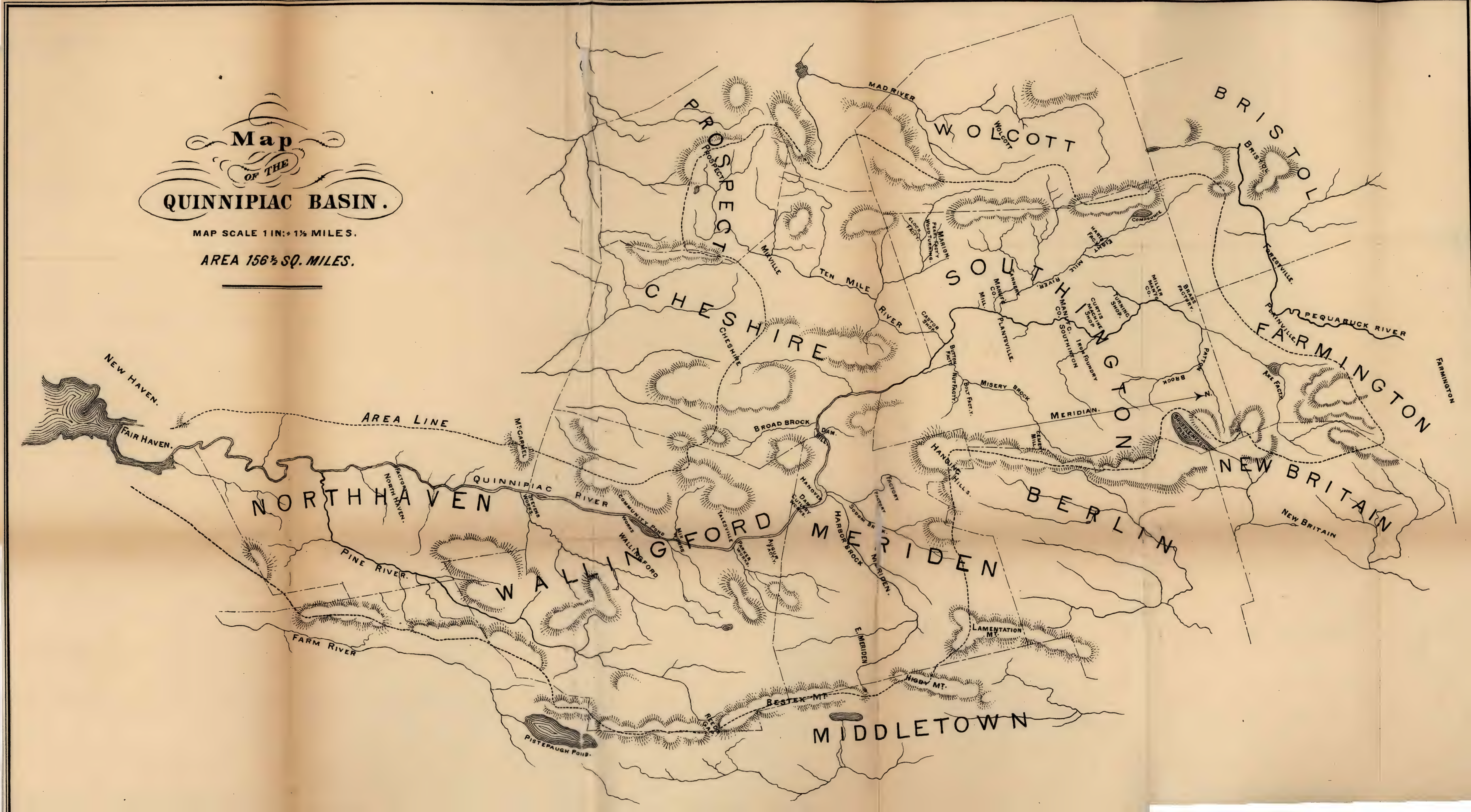
ON STATES PRISON INVESTIGATION,

PROF. W. H. BREWER,
DR. C. W. CHAMBERLAIN.

ON POLLUTION OF STREAMS,

PROF. W. H. BREWER.




Map
OF THE
QUINNIPIAC BASIN.
MAP SCALE 1 IN: = 1½ MILES.
AREA 156½ SQ. MILES.
PROSPECT
WOLCOTT
BRISTOL
CHESHIRE
SOUTHINGTON
FARMINGTON
NEW HAVEN.
FAIR HAVEN.
AREA LINE
NORTHHAVEN
WALLINGFORD
MERIDEN
BERLIN
NEW BRITAIN
MIDDLETOWN
MAD RIVER
TEN MILE RIVER
EIGHT MILE RIVER
PEQUABUCK RIVER
QUINNIPIAC RIVER
PINE RIVER.
FARM RIVER
BROAD BROOK
MISERY BROOK
HARBOR BROOK
PATTON BROOK
MERIDIAN.
HANGING HILLS.
LAMENTATION MT.
HIGBY MT.
BESTEX MT.
PISTEPAUGH POND.
COMMUNITY POND
COMPOUNCE
PLANTSVILLE.
YALESVILLE
NORTH HAVEN.
MT. CARMEL
E. MERIDEN
NEW BRITAIN
FARMINGTON
FORESTVILLE.
PLAINVILLE.
MARION.
MILVILLE
HANOVER

THE SEWERAGE OF MERIDEN.

This subject was first brought indirectly to our attention by the petition of the inhabitants of South Meriden, Yalesville, and Wallingford, with reference to the pollution of Harbor brook and the Quinnipiac river from the sewage and manufacturing waste received by Harbor brook in its passage through Meriden, which place it entered as a comparatively pure stream, and, as was claimed, was so contaminated that the health of the inhabitants of these villages was seriously impaired in consequence. In investigating the subject it was soon evident that the health of the city of Meriden was as much involved as that of the villages mentioned, and much more so than that of the more distant villages, and that the real point at issue was the disposal of the sewage of Meriden, without detriment to the health of its own citizens or of its neighbors. As an invitation was later received from the Mayor and Council of Meriden to investigate the sanitary condition of that city, the whole subject will be discussed under that heading to avoid unnecessary repetition, as the discussion of the points involved in the following letter from Mayor Lines includes all the topics presented by the petition before mentioned. The letter is as follows:

MERIDEN, August 6, 1879.

DR. C. W. CHAMBERLAIN,
Secretary State Board of Health:

DEAR SIR: Pursuant to a vote of the Common Council of the city of Meriden, passed Aug. 4, 1879, the undersigned have the honor to invite the State Board of Health to inspect said city with reference to its sanitary condition, our desire being that you visit us within the next two weeks if possible, or as soon thereafter as practicable—the wish of the city government being to have the advice of competent and disinterested men as to what action should be taken to promote the health and cleanliness of this city without causing damage or unnecessary annoyance to our neighbors. We trust it will be convenient and agreeable to your board to make this examination, and that your report shall cover the whole ground. We shall be very glad to afford you every facility

possible, and hope the result will be to the advantage of Meriden and all her neighbors.

Very Truly,
H. WALES LINES, *Mayor.*
JOHN L. RICHMOND,
Chairman Health Com.

Prof. Brewer, Dr. C. A. Lindsley, and the secretary were appointed as a special committee in response to this invitation, were directed to make a complete and thorough study, and were given ample authority to employ experts, procure maps, charts, and surveys whenever requisite. A complete topographical survey of the city of Meriden was obtained from S. C. Pierson, city surveyor of Meriden, and a map of the basin of the Quinnipiac from special surveys, the maps of the coast survey, county and township maps. The relative position of these towns and villages is well shown, and the location of every dam on the river. The map of Meriden shows also the density of population, the location of the principal manufactories, as well as the level of the streets. The sharp grades and abrupt changes of level are important elements in the problem.

The city lies in a circular basin, surrounded by mountains, and as will be seen at a glance, has but one outlet for drainage—by Harbor brook and the Quinnipiac river; this much is settled by the topography of the place.

The study of the questions involved in this case includes more points of general interest and importance than any that have been brought before the Board, and we have endeavored to make our work as thorough as possible. The latest phases of the sewage disposal question have been stated in our general report. This is in advance of any action yet taken in this country, and the irrigation plan has not been tried here on a large scale. How much the deep frosts of this country would interfere with the process is not absolutely determined, although there seems no reasonable doubt after the experience of Worcester and Lenox. It is not, however, claimed that the ideal has yet been reached with reference to the ultimate disposal of sewage, only that this plan is the most satisfactory yet devised, and by far preferable to the deposition or precipitation methods. The irrigation and filtration plan certainly promises to be unvaryingly successful.

Many of the questions involved here belong to the domain of the sanitary engineer. We at the outset availed ourselves of the

services of one of the most eminent and well known experts in that department, Col. Geo. E. Waring, Jr., whose report is here included. We have been largely guided by his judgment and present his opinions on many points, resting upon the authority of an expert in matters concerning which we can, from the nature of things have but a general knowledge.

The question generally stated is, therefore, about as follows: The city of Meriden, a rapidly growing city, with large manufacturing interests, having introduced a plentiful supply of water, must of necessity be sewered; how, therefore, can the sewage and manufacturing waste be disposed of without injuring the health of its own citizens or that of its neighbors? The brook which flows through the city is manifestly inadequate to safely dispose of the sewage, moreover, its course is obstructed by a dam near the city, which adds to the present unhealthful condition, delaying the outflow of the sewage, and thus promoting putrefaction. If the sewage and manufacturing waste can be rapidly removed and sufficiently diluted, the problem is solved. The manufacturing waste is, with the exception of that from the woolen mill, beneficial to the sewage rather than otherwise.

The small brooks which are used as open sewers are often overtaxed, and, in one or two instances, soil saturation is directly produced thereby. The present outbreak of diphtheria commenced in one such locality, that had been selected for thorough overhauling by the Board of Health. The maps indicate the volume of water that flows in the different streams proportionately, also, the probabilities of the Quinnipiac providing a never-failing volume of water for the proper dilution of the sewage. The subjoined letters* give the results of direct investigation.

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*Dr. C. W. Chamberlain,

Dear Sir: I have this day measured water running in Quinnipiac River, below Hanover Dam, and find the same to be 4,270,000 gals. to the hour. Have also measured the run of Harbor Brook in this city, just below Miller St., and find result 495,600 gals. per hour. I measured the Quinnipiac in the tail race of the cutlery works, the water just dripping over the dam (allowance duly made and added for same), time, 10 A. M.; and at 11.30 measured Harbor Brook. In both cases, of course, the water is rather low. I measured the river and the brook last March, when more water was running, and in both measurements the ratio of brook to river is nearly 1 to 9.

Respectfully yours, S. C. PIERSON.

The different points involved in the case are pretty thoroughly presented in the report of the Board to the Common Council, with that of Col. Waring. An abstract of Col. Waring's paper, read at Nashville, which was also sent with the other papers, is given here, as it describes the plan advised.

OFFICE OF THE STATE BOARD OF HEALTH,
STATE HOUSE, HARTFORD, NOV. 15, 1879.

To His Honor H. Wales Lines, Mayor of the City of Meriden, the Honorable Court of Common Council, and John L. Richmond, Chairman of the Health Committee:

The following report is respectfully submitted in response to your invitation to inspect the City of Meriden, and make such report as would cover the whole ground of the sanitary condition and requirements of the city. The questions involved have been somewhat intricate, and we have endeavored to give them sufficient and exhaustive consideration, with the aid of expert advice on matters that specially required the skill and training of the sanitary engineer. With reference to the organization of the health department, we would make the same recommendation for Meriden as for most of the cities in the State, that a permanent health board be established, with five members, three of whom should be physicians, to serve for a term of three years, with the Mayor chairman *ex officio*. The value of such an organization in inaugurating and

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DR. C. W. CHAMBERLAIN,

DEAR SIR: I have this day visited Hanover, and obtained the information you desired. Saw Messrs. Howell and Cady, practical managers of the Cutlery Co., who stated that no one had kept statistics, but in their observation the following things may be counted on: In 1868 there were six weeks when water did not flow over the dam at all. (They had kept the wheel running the usual running time, 10 hours.) They think that during the last two years there have not been more than six nights that the apron was not wet.

In dry times the ten hours' run draws the water down twelve inches.

For an average of all the years of their connection with the company (more than eleven years) the water has run over the dam 75 per cent. of the time while the power was in use.

Altogether it shows a very *uniform* and copious flow of water in the river. Mr. Cady states that he has had considerable experience with different water privileges, but considers this Hanover Pond the finest in that particular (uniformity).

Respectfully yours, S. C. PIERSON.

carrying forward systematic measures for improving the sanitary condition of the city would soon be demonstrated. The use of the small streams as open sewers is to be deprecated, and when they are manifestly inadequate, cemented vaults should be required by city ordinance, this subject should be placed under the direction of the health board, as also the systematic scavengering of the city, which should be regularly and thoroughly provided for at the public expense. Proper receptacles for the storage of garbage, ashes, and refuse should be required by ordinance, to be emptied by the public carts.

All minor points, however, might be safely left to an intelligent local board of health, which should have power to make and execute all such regulations, all expenditures to be regulated by the Council, as in other departments of the city government.

The zeal and activity of the present Health Committee are worthy of all commendation, but the nature of their work, indeed, has brought them to about the same conclusion as we recommend. It is established beyond controversy that the rapid and complete removal of waste and excrete matter, or the sewerage and drainage of a city, is essential to comfort and health, is a prime necessity under all conditions, and rendered especially necessary when an abundant and constant water supply is provided. This Meriden has exceptionally good, both as to quality and quantity, but with no system of sewerage. The retention of refuse and excrementitious matter for any lengthened period of time in privy vaults, cesspools, slaughter-houses, or in any other places in the midst of towns or inhabited districts, and the saturation of the soil creates a nuisance dangerous to health, and has a close and causal relation to the prevalence of disease. The importance of thorough and systematic drainage, by which the subsoil water of wet districts may be lowered and be preserved from pollution by the filth and refuse of towns, is beginning to be recognized. Malarial diseases have thus been caused to disappear from special localities and wide areas of country, while consumption, the peculiar scourge of New England, has been notably diminished in frequency, as repeatedly demonstrated both in this country and Europe, and the general healthfulness markedly increased, as shown in lessened sickness and death rates.

The drainage of the low lying land in the central portions of the basin or valley of Harbor Brook is impeded by the dam a short distance below the town, and, as a matter of course, the natural

drainage of the whole region is interfered with, and subsoil moisture retained in the higher levels as well as the lower. This necessarily favors the existence and prevalence of malarial diseases, and would be ground enough to recommend the removal of this dam, if for no other reason. The lowering of the bed of the stream and its use as an outlet for the surface drainage, as recommended by Col. Waring, would still further aid in complete drainage of the district, and conduce to its general healthfulness.

The present defective methods of disposal of the sewage affords examples of the most dangerous and offensive forms, and those conditions most detrimental to health. A large proportion of the sewage and manufacturing waste finds its way to Harbor Brook; by the dam below the city a settling basin is formed, extending up the ravine nearly to the borders of the city, and from the intermittent use of the water, from the reservoirs above the city the banks for a considerable distance are alternately covered and exposed. While covered the solid material of the sewage is deposited, and when exposed to the sun, dried, and taken up into the air, to carry the germs of disease and pollute the air along the course of the stream. The pond thus formed during a considerable portion of the year is a mass of putrefying and decaying sewage, pouring deleterious gases into the air. These can be seen bubbling up through the turbid fluid, and a thorough analysis further demonstrated the nature of the processes here taking place.

The question whether Harbor Brook furnished sufficient volume of water to dilute the sewage and manufacturing waste of Meriden, so that it would be safely disposed of by aeration before decay and putrefaction should commence, is largely a question of sanitary engineering, so that in our conclusions we have been largely guided by the opinion of Col. Waring, who was employed by the board to investigate the whole field, with reference to an outlet for the sewage of Meriden. The amount of sewage material now to be found at different points was also ascertained by careful analysis, the results corroborating the conclusions reached before from the conditions of the case.

As it is a matter of constantly increasing importance and necessity that the city be provided with an adequate system of sewerage, the question arises: How can this be accomplished, so that no interests be jeopardized? This result can be permanently and effectually secured by providing a trunk or main sewer, whose outlet shall be below the dam at South Meriden, and the disposal of the

sewage by irrigation and filtration upon the land which is there naturally favorable for such use. This, in a sanitary sense, is the most satisfactory solution of the problem. The experience of other cities similarly situated has proven its value, and there is little question that sooner or later some such disposition would be made, even if at first the plan was adopted to use the river. By adopting this course at the outset all harrassing and needless litigation would be avoided, and the question satisfactorily settled for all time. By combining the system of filtration and irrigation less land would be requisite, and a better provision made for the winter months. The experience of some thirty or forty cities has demonstrated the value of this method ; its permanency is shown by the use of the meadows near Edinburgh for hundreds of years, as after the first outlay but little care and superintendence is requisite. The tendency is strongly towards this method of the disposition of sewage wherever practicable, unless it can be discharged directly into the sea, and to the absorption method rather than the cesspool system, wherever a small lawn is available. In all probability the sewage would be sufficiently diluted if discharged directly into the Quinnipiac, below Hanover dam, near the junction of the mill-race with the river. In the opinion of Col. Waring, this would be a satisfactory disposition of the sewage for a city much larger than Meriden. Or subsidence tanks might be provided, and the resulting sewage settlings, mixed with the ashes and garbage of the city, be used as a fertilizing material for the plains below Meriden. The most satisfactory, and, in the end, cheapest and best disposal of the sewage. however, is by the method of irrigation and filtration first indicated.

By order of the State Board of Health,

C. W. Chamberlain, *Secretary.*

John S. Butler, M.D., *President.*

The following is Col. Waring's first report, which was subsequently confirmed. An estimate will be given in appendix of the expense of the system.

Dr. C. W. Chamberlain,

Secretary State Board of Health, Connecticut:

Dear Sir:—After an examination of the conditions affecting the questions submitted to me in connection with the sewerage of Meriden, I beg to report:

I. The delivery of a considerable amount of household drainage and of manufacturing waste into the Harbor brook within the city of Meriden, now existing, may reasonably be considered a legitimate subject of complaint on the part of those who reside near the Hanover pond, in which the waters of the Harbor brook are arrested. If there exists in the village of Hanover a specially bad sanitary condition, it would certainly be reasonable to ascribe it largely to this fouling of its pond.

Naturally, as Meriden grows and as more of those living near the brook and its branches seek to relieve themselves of the inconvenience of overflowing cesspools by discharging the surplus waste into these streams, this difficulty will increase and become more serious. I should say, however, that the probabilities are that Meriden itself will suffer quite as much from the arresting of foul matters along the course of the brook and in Andrew's pond, as the people of Hanover can from the deposit in their own pond.

II. So far as the village of Hanover is concerned, the difficulty will of course be seriously aggravated by the carrying out of any comprehensive system of sewerage which shall have the effect of delivering into the Hanover pond a very increased amount of organic waste, all of which will be carried directly to the outlet of the sewer, instead of lodging, as much of it now does, along the course of Harbor brook. Even the present amount of sewage, if delivered through pipes so that it would all be carried forward to the outlet, would become much more serious, so far as the village of Hanover is concerned. Of course, the adoption of any sewage system will lead to a very great increase of such delivery.

The execution of the system of sewerage at present contemplated by the city of Meriden would further increase the difficulty by adding a large amount of road wash to the household and manufacturing wastes above referred to. I therefore suggest that it should be made a condition precedent to the carrying out of the proposed system of sewerage in the city of Meriden, or of any other system of sewerage that may be substituted therefor, that, *as the beginning of the work*, an outlet sewer should be constructed to deliver at a point below the Hanover dam. By the plan proposed, it is contemplated to deliver the sewage matter into the present bed of Andrew's pond, Andrew's dam being removed.

This would lead to the delivery of nearly the whole volume of sewage matter into the Hanover pond, which could not fail greatly to aggravate the present unfavorable conditions.

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The delivery of the sewerage of Meriden into the stream at the foot of the Hanover dam would, in my opinion, remove every reasonable objection that the village of Hanover could bring against the carrying out of the proposed work.

In time, but perhaps in a very long time, as the population of Meriden increases, and as the banks of the Quinnipiac below Hanover become more densely settled, the population perhaps even as far down as Wallingford would be annoyed and endangered by the delivery into the river.

Should these conditions arise, it will be a very simple matter to purify the effluent during the summer season, when alone this will be necessary, by the agricultural irrigation of the lands a short distance below the village of Hanover and on the west side of the river. It did not seem to me, in my examination, that it would be either cheaper or better to attempt to purify the effluent by irrigation between Meriden and Hanover pond.

III. As the question submitted to me related also to the sanitary condition of the city of Meriden itself, I beg to call your attention to two considerations which seem to me important.

1. The plan of sewerage now contemplated for Meriden has in view the removal of a very large proportion of the storm-water—the water of all rains except such very severe or prolonged storms as occur only five or six times during the year. It is seriously to be doubted whether in a sparsely settled community, with a large surface area in proportion to the population, any country town or city like this can afford or needs a provision for removing storm-water by underground conduits. The plan proposed will be enormously costly in execution, and will still be inadequate for the only storms which could cause any damage to public or private property. There is at present no provision for an underground removal of storm-water, yet, so far as I can learn, no serious damage is ever produced by storms; and the slight inconvenience resulting from overflows, as at the corner of Main street and Veteran street, may be obviated by works of very trifling cost. If the idea of taking storm-water or surface wash into the public sewers is given up, and the size of the different sewers is adjusted to the removal of household and manufacturing waste only, the whole problem will become very much simplified.

The system of sewers which I have in mind would be sufficient for the removal of the waste of a population of 50,000, with a proportionate increase of its manufactures.

2. While the withholding from Harbor brook of all organic wastes, except the street wash, which would enter the stream only when considerably swollen by rains, would so ameliorate its condition as to remove the offensiveness of which complaint is now made during the summer season, it is worth while to consider the great improvement to the public health that would result from a sufficient drainage of the swamp which now occupies the heart of the city. This can be perfectly accomplished by removing Andrew's dam, and by lowering the bed of Harbor brook quite through the whole length of the city, so as to bring the surface of the water ten feet below the flat lands adjoining it. This improvement would be of only temporary value if it stopped at a simple deepening of the brook, leaving its shores and bed subject to disturbance by floods. It would be necessary to give a smooth, narrow, and permanent channel to the stream. With the grade afforded by the natural conditions the ordinary flow of the stream (the flow at the time of my examination) would be carried by a semi-circular channel five feet wide and two and one-half deep at the center. This channel should be, of course, securely paved with stone or planked to afford protection in time of flood. The sides of the channel above the edges of this gutter should be sloped back at least one and one-half horizontal to one perpendicular to the height or nearly the height of the stream.

Throughout a large part of the course, this slope could be sufficiently protected against the action of occasional floods by sodding. But in situations where grass would not grow, as where the stream passes under buildings, bridges, etc., the slope should be paved.

A similar improvement of the tributary streams of Harbor brook, reducing the level of the water to at least five feet below the surface of the ground, I am confident would result in an amelioration of the sanitary condition quite equal to that sought by means of sewerage.

Very respectfully yours,

(Signed) GEO. E. WARING, Jr.

Newport, R. I.

ABSTRACT OF COL. WARING'S NASHVILLE PAPER.

The arguments in favor of exclusion of storm-waters from sewers are in brief:

1. The increased cost of the large sewers.
2. Increased difficulty in ventilation with increase in size.

3. The larger become sewers of deposit, especially in hot weather, and their contents decompose.

4. The increased volume increases often the difficulty of satisfactory ultimate disposal.

5. The catch basins oftentimes become nuisances.

In the plan for small sewers the smallest should be six inches in diameter; no larger size until this with its branches, at time of greatest use, fill half full, and the size should then increase gradually. The interior should be kept perfectly smooth. Care should be taken to prevent roughness at joints. Terminal sewers should be provided with a flush tank at upper end to secure daily flushing. Sufficient man-holes to provide ventilation should be furnished—one every 1000 feet. Every house should be connected *without a trap*, but with soil pipe four inches in diameter running to a point above the ridge of the roof. The inlets to the sewer should be funnel-shaped, pointing towards the direction of the flow. The outlet, if water-locked, should be provided with means for admission of fresh air—if open, protected from winds.

The system of small pipe sewers for the removal of foul drainage, manufacturing waste for the most part, excluding surface and storm waters, is unqualifiedly recommended by the Board. The character of the subsoil favoring soil contamination, easily becoming "excrement sodden," is a strong argument in favor of impervious sewers. If constructed so as to allow the entrance of subsoil water, the sewers will of necessity allow the filthy sewage liquids to pass out. The drainage can be readily provided for by agricultural tile drains, if necessary accompanying the sewers, laid alongside them.

There is little doubt but that the health of Meriden and South Meriden have been unfavorably affected by the present disposal of sewage. The great prevalence of diseases of zymotic type, of malarial fevers, and depressing, debilitating forms of sickness, bear witness to this fact. The letter of Dr. Nickerson, a careful observer, is interesting in this connection:

MERIDEN, CONN., Sept. 28, 1879.

DEAR DOCTOR: My friend, Dr. Catlin, handed me your letter of the 15th inst. asking for information in regard to the malarial epidemic in our vicinity, and at his request I will make a brief reply.

When I came here from the army in 1865, I found frequent evidence of malarial infection, and early found that I was compelled to recognize that fact in my treatment of nearly all my cases

of disease. I met many instances of sciatic neuralgia, ophthalmia, bilious colic, dysentery, etc., of a decidedly intermittent type, and curable by the use of quinine in full doses. But after consultation with physicians, I think I am safe in saying that the first cases of well marked "chills and fever," so called, indicating the onset of a sharp epidemic, occurred in 1868, and they became more numerous until, on my return from Kansas, in 1870, I found it prevailing extensively in Meriden and vicinity, being especially severe in the village of Hanover, two miles south.

We had previously had two summers of unusually long continued heat, prostrating our nervous systems and rendering us peculiarly liable to malarial forms of disease. Gradually the manifestations of the attacks lost their purely nervous character, and we had the continuance during the interval of symptoms that pointed to chronic engorgement of the liver, stomach, and spleen. Bilious remittent fever, once a *rara avis* in New England, became the prevailing type of fever after a time, not so readily arrested during the first week, but in many cases developing typhoid symptoms after nine or ten days.

In 1875 the epidemic seemed to have reached its most violent point, and we have met less cases of decided intermittent, attended by marked chill, fever, and sweating, but we find very common all the phenomena characterized by the books as "chronic malaria," all cases being more persistent, more depressing, attended by more evidence of gastric disturbance, and less amenable to the usual forms of medication.

We now have typho-malarial fevers, bilious pneumonias, low types of dysentery, persistent enlargement of liver and spleen, accompanied by severe and obstinate cough, pains in the side, etc., rheumatisms of a decided malarial form, and a peculiar affection attended by spinal tenderness, and tingling in the extremities.

During the past five or six years we have watched, in connection with the above, the gradual development of a typhous element, complicating nearly all the malarial forms of disease. This we have attributed to our vicious hygienic surroundings, our increasing population, our want of any proper system of sewerage, all rendered more virulent by our liberal water supply. In other words, we have been once more illustrating the fatal experience of a growing city introducing a water supply without the compensating sewerage. This element has given us many diphtheroid diseases—croup, erysipelas, puerperal fever, etc., etc., which have been the main contributors to our large death list, and still continue with unabated force.

Practically all these should be considered as complications of the main epidemic—the malarial,—and my observations in Meriden during these years gives me confidence to affirm that more lives would be saved if we could, in our treatment of all the above forms, pay less attention to these complications and keep our eye

steadily directed to the epidemic extensively prevailing at the time. I remain, very respectfully,

Your obedient servant,

N. NICKERSON.

Dr. C. W. Chamberlain,

Sec. State Board of Health, Hartford, Conn.

The existence of malarial fevers along the valley of the Quinnipiac is apparently part of the general movement, as there has been a steady encroachment upon new territory each year, both Hamden and North Haven below Wallingford have suffered much more severely than the villages between North Haven and Meriden ; in Hamden and vicinity there was excessive mortality from typho-malarial and congestive fevers—twelve deaths in Hamden, and five in North Haven. So that the existence of malarial fevers in the region generally is part of a general epidemic influence whose causes and periods are not yet well understood.

The typhoid and low æsthenic debilitating forms of the disease are doubtless favored and induced by sewage emanations. In the opinion of Dr. E. M. Hunt of New Jersey, and others, malarial fevers are produced by excremental contamination of soil, water, or air, in the same general manner as typhoid. However that may be, there is little doubt of the baleful influence upon health of Harbor brook and its emanations in its present condition. The following analyses show that traces of sewage contamination can hardly be found by the time Wallingford is reached:

	Harbor Brook.			Quinnipiac River.	
	At Andrew's Dam.	Hanover.	Yalesville, Mix's.	Above Meriden.	Wallingford.
Total solids—grs. per gallon, - -	12.7	5.5	7.2	4.9	6.1
Of such, volatile below red heat, -	3.0	2.2	2.7	1.0	1.6
Chlorine, - -	0.46	.23	.27	trace	trace
Free Ammonia, parts per million, -	.93	.28	.315	.063	.076
Albuminoid Ammonia, parts per million, -	.27	.07	.020	.032	.020

There is no very great difference between the last two, yet the first is water taken from the Quinnipiac river a mile above Meriden, between Meriden and Cheshire; the latter, water from the

lower end of the reservoir at Wallingford. All trace of sewage contamination has almost if not entirely disappeared; the difference, indeed, is not well marked. Following the course of the Quinnipiac from Yalesville to Wallingford in a flat-boat, it was found to be quite rapid often, and the water thrown into ripples and exposed to the air by frequent shallows and light falls and rapids. This condition of the river would indicate the possibility of a complete oxidation of the sewage if discharged into the river, the changes taking place so uniformly and rapidly that no gases of decay would contaminate the air, consequently no detriment to health ensue. If diluted with a proper volume of water, sewage can be disposed of by water carriage without detriment to the health of any living near the stream thus used. Of course, the less of such material finding access to our rivers the better, and we should advocate the purification of all sewage before its admission to any river; but if that cannot be secured, the next best plan must be followed.

The committee of the Common Council of Meriden have accepted the recommendations of our report with some reservations, as follows: (Since then an estimate of the cost of the small sewer system has been furnished by Col. Waring, and is given below. We here quote from the Meriden committee's report.)

"In the first place, Andrew's dam should be removed and the mud and filthy sediment cleaned out. We do not propose the lowering of Harbor brook through the city, for, among other reasons, the nature of the subsoil makes it too costly an undertaking, and we are convinced that when the railroad bridge is built and the deposits above that point removed to the established grade, the drainage will be satisfactory, or as nearly so as we can afford to make it. We favor the establishment of the bounds—sides, top, and bottom—of the several brooks flowing into the main stream, the capacity of the several streams to be such as will discharge the water of their sheds in times of great storms. We urge that the several streams, including Harbor brook, be regularly cleared of filthy deposits, the construction of pipe drains for large accumulations of storm-water. . . . . . We advocate the disposal of sewage . . . by means of small pipes and a comparatively small trunk sewer to some point below Hanover dam, there to discharge into the river.

"ESTIMATE FOR SEWER.

Main trunk, 18 inch sewer,	18,400 feet,	at $1.30,		$23,920
15 " "	1,350 "	1.00,		1,350
12 " "	13,050 "	.82,		10,701
10 " "	16,775 "	.71,		11,626
8 " "	49,945 "	.59,		29,467
6 " "	63,820 "	.53,		33,825
				$110,889
Add for work, etc.,				15,000
				$125,889
15 per cent. for engineering, quicksand, etc.,				18,883
				$144,772
$10,000 for land drainage,				10,000
				$154,772

"The estimate formerly contemplated involved an expenditure of $550,000," that is sewers to include surface and storm-water, with outlet at Andrew's pond instead of below Hanover. The lessened cost of labor since the former estimate is probably offset by the difference in outlet.

NEW BRITAIN.

Like most of the older cities constructed before the value of the services of the sanitary engineer was appreciated, many artificial sources of water, air, and soil pollution detrimental to health have been caused as a busy, thriving, manufacturing city was developed from the straggling, irregularly arranged collection of buildings that first marked the site. Other than sanitary considerations generally control the location of cities and villages. Some natural advantages for manufacture or commerce control the selection usually, the higher levels are chosen for the construction of dwellings, the low lands used for shops, stores, and factories.

In process of time, however, as the necessity for tenements near the centers of work and trade increases, the low lands are utilized for buildings; swamps and hollows that have been filled in with refuse and garbage are used also as sites, and dwelling houses are constructed upon this reeking, fermenting, and in some cases excrement-sodden foundation. The natural slopes and levels receive no attention, nor in the process of grading, constructing new streets, and public works generally is the slightest consideration given to the outflow of the ground water when the provisions for its movement that naturally existed are carelessly obstructed and destroyed.

As a matter of course no thought is paid to removing conditions naturally unfavorable to free drainage. The relations of the level of the ground water to the healthfulness of a place have indeed been but recently recognized; as a general rule the lower the level of the ground water, that is, the further it is necessary to go below the surface before the water line is reached, the greater is the healthfulness of a place, and the nearer to the surface the ground water reaches the greater the unhealthfulness to be expected, with of course some exceptional conditions. The most unsanitary condition, however, is a constantly fluctuating level. This explains one of the natural disadvantages of New Orleans:

Conduit from Shuttle Meadow
WALNUT HILL PARK
about 150 ft. above Main St.
SUMMIT RESERVOIR.
ROAD
WEST MAIN ST.
LAKE ST.
LAKE
MYRTLE ST.
CAMP ST.
HIGH ST.
So. HIGH ST.
SCHOOL ST.
WALNUT ST.
COURT ST.
line base of Walnut Hill
ARCH
24"
WEBSTER ST.
LAFAYETTE ST.
WASHINGTON
ST.
30"
PARK
CHURCH ST.
COMMERCIAL
EAST MAIN ST.
MAP LEDGE
Area line low swampy ground
PEARL ST.
CENTER ST.
ELM ST.
PARK
CHESTNUT ST.
N.Y. & N.E.R.R.
FRANKLIN ST.
SEYMOUR ST.
NORTH EL
STANLEY ST.
N.
S.

Map of NEW BRITAIN,

showing sewer system.

EXPLANATIONS.

– – – – – The area within this line is mostly low, swampy ground, poorly drained in many sections. Within this area Diphtheria and Malarial diseases have been very prevalent.

– · – · – The outline of the base of Walnut Hill.

–·–·–·– The outline of the base of what is known as Dublin Hill, being a little higher and of the same formation as Walnut Hill.

AM. PHOTO-LITHO.CO. N.Y. (OSBORNE'S PROCESS.)

the ground water comes within two or three feet of the surface, and by constant action soon permeates the walls of vaults, cesspools, and the like, and allows seepage of their filthy contents. The ground water when polluted is a ready carrier of contamination constantly in action. After a while the occurrence of some epidemic, either caused directly or prepared for by the polluted ground water and contaminated soil, attracts attention to the unsanitary conditions that exist, and sewerage, and perhaps drainage, are considered.

One of the resultants of impurity of ground, air, and water—for we must remember that there is no vacuum in nature, and that the spaces between the molecules and particles of the soil is occupied by fluids or gases, and above the level of the ground-water these spaces are filled with air, which also is in constant motion, and is more or less laden with the moisture, and as a matter of course with all the pollutions of the soil and water. A cellar thus becomes an intercepting tank for the reception of the ground-air which is eventually drawn up into the occupied rooms. The ground-air contaminated by the gases from sewers and drains thus infests every nook and corner, and, as has already been stated, is drawn in by the difference in temperature creating an inward and upward draft in the house.

Each year as the population increases, the amount of waste and filth to be disposed of increases *pari passu*, and the distance between wells, cellars and houses and accumulations of filth of all sorts lessens. With sublime indifference to results, filth is allowed to accumulate in vault and cesspool, and few think of any regular and systematic methods of disposal, until compelled by actual necessity. Such receptacles are, as a rule, entirely neglected.

These are some of the unsanitary conditions that are caused by carelessness, and ignorance of the principles of hygiene. Public parks, drainage, sewerage, and a pure water supply are neglected as well, until the city has grown to considerable dimensions; last of all, and to be searched for far and wide, are school-houses, churches, and public buildings constructed and maintained in accordance with hygienic laws; these are not the first buildings constructed for such purposes by any means, but are the last of a series, resultants of a process of evolution. The development theory appears to fit in here charmingly, especially in the requirements it makes in the element of time.

At present there is no difficulty experienced in the disposal of

the sewage of New Britain. A good outline of the proposed system is given by the accompanying map. As will be seen, the greater part is to be discharged into one of the branches of Little river. This stream flows through the towns of Newington and West Hartford, joining the Little river in the latter place. It is a very rapid stream in the greater portion of its course, and flows over a pebbly bed varied with cuts through the clay. Its whole course was followed up by the committee of the Board, and several specimens of the water analyzed. In New Britain a brook of considerable size, in fact the head-waters of the stream, is turned into the trunk-sewer, and flows through it constantly, thus keeping the trunk-sewer flushed, and diluting the sewage. The sewers in New Britain receive the surface and storm-water, and as they are built of pervious material, act also in lowering the subsoil water.

The alternation of hill and lowland is indicated in the map. On the north and west of the city there are hills with an elevation of 600 to 800 feet, running north and south, and among these hills is Shuttle meadow lake, the source of water supply for the city. This lake is shown in the map of the basin of the Quinnipiac river situated just beyond the divide outside the area line of the valley of that river. The water is upland surface water. The pond is filled in summer with vegetation, which sometimes gives the water an unpleasant taste.

The pond is an artificial body of water, high, rocky cliffs rise abruptly on the east and west side, on the north the land rises gradually and is under cultivation. The water is carried 2¼ miles to the distributing reservoir on Walnut Hill, shown on the map. A million gallons per day is the average use. The water as stated becomes offensive in summer, and well water is often substituted. There are four public fountains in the city.

The area included within the city limits is four square miles, about one-fourth of this closely built up. The trunk sewer is half a mile long, and there are four miles of sewers constructed which empty into this; the smaller branch sewers are circular, 18 inches, of Akron pipe, brick, from 20 to 42 inches, egg-shaped. The trunk sewer is of brick, circular in shape, and is six feet ten inches at mouth.

Branch sewers are planned for the whole city. House connections in case of the sewers laid are not yet universal. So the question as to the capacity of the brook to dispose of the sewage is not yet fairly tested. As it does not touch any inhabited region

for some time, it may prove adequate to dispose of the sewage before it reaches closely inhabited regions, or any dwellings near its banks, as it flows through fields. The sewage would be unobjectionable in cultivated fields, as it would add to their fertility. Some enterprising farmer might now find it to advantage to construct channels through his fields to divert the stream and cause it to yield up a portion of its fertilizing material before it passes along. There is abundance of land well situated for irrigation, which offers a solution for the problem of the ultimate disposal of the sewage, should the capacity of the brook be overtaxed. The rapid current and the amount of vegetation along its banks favor the rapid disposal of the sewage. Already the meadows through which it flows take on a richer green for considerable distance along its course. As the stream runs, it has probably a twelve-mile course before emptying into Little river. The bends and turns are numerous.

A question arises, however, of more importance when the brook flows through pastures and is used for a water supply for cattle. Thus far not enough sewage enters the brook to cause any apprehension on this score, even in low water in summer, as the volume of water from the water supply would maintain some volume to the stream, also the manufactories contributing some from their reservoirs.

The spread of typhoid fever and diphtheria through the medium of milk, as described in the case of typhoid fever by Drs. Duncan, Ball, and others in England, and the epidemic of diphtheria in the north of London, reported by Dr. W. H. Power, attracted considerable attention, and the question was asked whether in the case of sewage water being drank by the cows the milk might not become infected.

In the instances above referred to the milk became infected by human agency after it was stored in pails or pans or in process of milking. Scarlatinal infection is believed to have been communicated to milk during the act of milking, by persons the skin of whose hands had been peeling during convalesence from that disease. "In Penrith a domestic servant suffering from typhoid fever was brought home to her parents, who supplied fourteen families from their dairy. Seven of these families took the disease. There had been no previous cases." In Dr. Ballard's report 107 cases occurred. The dairyman and two of his family had typhoid fever. The well was a few yards from the privy.

The handle of the pump was chained and locked. A sudden cessation of fever cases occurred about fourteen days later, just the incubation period of typhoid fever.

The milk becomes infected, therefore, in cases when it becomes the agent in the spread of disease. The washing of pails and cans in infected water would be sufficient to infect the milk. Unless, therefore, the cattle were made sick by the drinking of impure water, it is not easily seen how any danger could arise. Thus far cattle have refused to drink badly tainted water, and it is not probable that it would be consumed under circumstances that would render it noxious. What the results might be in case of a severe epidemic of scarlet fever or diphtheria in New Britain is a matter of conjecture. It is not, however, probable that the disease germs would survive passage through the digestive organism and secretory systems of the animal and infect the milk. There is a thousand-fold more danger of milk becoming infected by cases of infectious disease in the dairyman's family or the contamination of the water used about the dairy in cleansing the pans, etc.

A systematic removal of garbage should be provided, and greater care in disposing of the scavangering waste and the exclusion of garbage and offal from the material used in filling and grading. As the country becomes more densely populated greater care will be compelled in such matters. Next to sewerage a thorough scavangering ranks in the sanitary requirements of city.

The following mortality statistics are instructive :

	1875.	1876.	1877.	1878.	1879.
Malarial fever,	1	4		3	8
Typhoid fever,	11	7	8	1	1
Cerebo spinal,	7	2	1		1
Erysipelas,	2	1			
Dysentery,	1	1	2	5	1
Diarrhœa,	51	20	16	10	14
Scarlet fever,	1	1		17	9
Diphtheria,	11	54	31	6	7
Croup,	8	15	5	1	1
Measles,			1		
Whooping-cough,			1		
Consumption,	28	18	14	20	18

THE POLLUTION OF STREAMS.

PROF. W. H. BREWER.

This subject has been discussed in this State during the past year more than usual, but this is because of a growing interest in the matter rather than because of any new features. Special cases have been before the Board, but there has been no general investigation made by the Board or its committee sufficiently full to call for an extended report.

But throughout the world, every year shows a growing sentiment for the better legal protection of the purity of drinking-waters. This is much easier where the source is in springs or wells, because of the localization of such water supply; and yet, as a practical matter, it is often much more difficult to effect than it ought to be.

In the case of streams, it is vastly more difficult for a variety of reasons, not the least of which is that the manufacturing industries are affected, and moreover its relations to the general health is more extensive and varied. This question is now more generally before sanitarians than any other single sanitary problem, and as yet no solution has been reached which will satisfactorily reach all the difficulties. The best results are compromises which have been reached at the expense of other disadvantages. It is before every Health Board in some way. The International society for the prevention of pollution of rivers, the soil, and the atmosphere, held its third annual meeting at Baden Baden in September of this year, and indeed we may say that the whole civilized world is at this problem.

There are now over twenty places in this State with water-works, about three-fourths of which are public works, the others are private companies. Sixteen of these works supply places having an aggregated population estimated at 230,000. Anything so directly affecting the health of so many people in this State should

receive an amount of attention and study we have as yet been unable to give, further than to attend, as best we can, to the special questions when they arise. Any general report must therefore be deferred.

REPORT OF COMMITTEE ON STATE PRISON.

In April the Prison Commissioners asked the Board of Health to make a sanitary inspection of the State Prison at Wethersfield. In response to this, Dr. Chamberlain and Prof. Brewer, as a committee, have twice visited the prison, respectively on Tuesday, April 29, and Saturday, Dec. 6, 1879.

At the first visit a careful examination was made, and various things were found in the sanitary condition of the place which the committee found reason to criticise, and to make recommendations accordingly. At the time of the second visit, the sanitary conditions were so much better that the examination was not carried farther than to the shops, the yard, and the manure heaps in the rear.

Between the dates of these two visits, inquiries were made relative to other prisons; both members of the committee visited in person the Tennessee State Prison at Nashville, and one member the State Prison at Auburn, N. Y., and the State Prison at Richmond, Va., and inspected the sanitary conditions, arrangements and appliances, the hospital, and the method of keeping the hospital books. Every facility was most courteously afforded for their investigations.

It is impossible to say how much of the sickness and mortality of the year previous to our first visit was due to conditions beyond the control of the prison officials; and the method of keeping the hospital records is such that it is very difficult, if not practically impossible, to learn from them what the health or sickness of the prisoners was at any one date or period.

"The Cove" back of the prison is doubtless an unwholesome neighbor, but so long as the prison is where it is, this must be endured. The prison itself is faulty in its original construction. The hospital accommodations are not what they ought to be, and the committee think they should be bettered, and if the State concedes with these views and is ready to act, this Board will be glad to render any aid it can.

In the meantime the committee beg leave to make the following suggestions:

1. That the *insane* be treated elsewhere than in the prison. This ought to need no argument at this period in the history of prisons, and in the light of our present knowledge respecting the treatment of the insane—and, indeed, the committee have no new arguments to offer. A prison, and a hospital for the treatment of the insane, are so opposed to each other in all their objects and practices, save the one of isolation from society, that it ought not to be asked that the officers of the prison should manage both kinds of institutions. When the physician in charge, or any other properly constituted authority, is convinced that a convict is insane, every interest of humanity and the ultimate good of the State demands that he should be treated in the way which experience has shown as best for the insane, and by those persons to whom the State has entrusted the special care of such unfortunates.

DAILY HOSPITAL REGISTER

For the month of - - - - - - 18

A

Date.	Patients in Hospital.	Out Hospital. No. Applications for Treatment.	Out Hospital. No. Treated.	Out Hospital. No. not Treated.	No. Excused from Work.	Whole Number in Prison.	No. Received in Hospital.	No. Discharged from Hospital.	No. Died.	Remarks.
1										
2										
3										
4										
5										
6										
*										
*										
*										
*										
29										
30										
31										
Total										

2. That a different system of hospital records be adopted. In all those other States where we have any special information pertaining to this subject, the records are kept much fuller and more systematically than in ours, and in some, if not in all, this fuller information is specially demanded by State laws.

We recommend that three books be kept for classifying hospital information, besides the daily blotter.

The first, which may be called the *Personal Record*, to contain the physical condition of each convict at the time he is received into the prison, (or when the book is opened,) and of his ailments later, that his condition during his prison-life may be learned without wading through the daily reports for the whole period.

The second to be a *Daily Hospital Register*, so kept that the sanitary condition of the entire prison as indicated by the sickness of the prisoners may be seen each day, the pages so ruled that each page will be the register of a month. A blank is appended marked A, as a suggestion. This has been suggested by and simplified from the "Daily Prison Register" used in the prisons of New York State, where the record is carried out to sixteen columns, but which we have simplified to nine.

MONTHLY HEALTH STATEMENT.

B	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
I. Zymotic.													
Malarial Fever, - -													
Typhoid Fever, - -													
Diarrhœa, - - - -													
Contagious Diseases,													
Other Zymotic Dis'es,													
II. Constitutional.													
Rheumatism, - -													
Consumption, - -													
III. Local.													
* * * * *													
IV. Developmental.													
Old Age, - - -													
V. Accidents.													
Hurt in Shops, - -													
Other Accidents, -													
* * * * *													
Total, - - - - -													

The third, which may be called *Monthly Health Statement*, to show the prevalence of each ailment for each month of the year. A blank, marked B, is appended as a suggestion rather than as an absolute model, the list of diseases to be as full as the size of the page will allow, but made fuller than my sheet shows. If preferable, such a statement might be made for each week, but we think that for each month will be on the whole better. In some States, such a monthly statement is required by law to be presented to the Legislature at the end of each year.

The value of such records as we have suggested will not, we think, be questioned, and that it is perfectly practicable for the hospital attendant to do it is proven by the fact that in other States they are so kept, and indeed much fuller than we have recommended. The plan for hospital records was submitted in outline to the physician in charge and the warden, and met their approval.

3. That the place in the rear of the yard used to deposit filth, to be sold as manure, be entirely covered by a roof, and that the material during the warm weather be removed as fast as it accumulates.

SPECIAL REPORTS.

DRAINAGE OF FAIRFIELD.

SICKNESS FROM IMPURE ICE.

DRAINAGE OF FAIRFIELD.

The following account by Mr. F. Sturgis of Fairfield presents a graphic account of the changes in that locality and the drainage work undertaken. The accompanying map shows the relation of the points mentioned. The letter presents the subject so fully that no further comments are required. With the omission of a few sentences, it is as written:

FAIRFIELD, November 25, 1879.

DR. C. W. CHAMBERLAIN,

Secretary of the State Board of Health.

My dear Sir: At the suggestion of Dr. Garlick, I beg to offer to you a summary of the drainage work undertaken and accomplished during this season in this village, and to submit for your consideration the reasons which have induced us to undertake it. The accompanying diagram will give you the relative positions of the various portions of the work, and will serve as explanatory of the general subject. Fairfield and Mill Plain I shall speak of as a whole, in order that I may cover the ground which has occupied our attention. This district is bounded on the west by Mill river, on the east by Ash creek, on the north it follows the course of Mill river until it reaches the hills, and on the south is bounded by the Sound. The lay of the land is first the sand beach, then an extent of salt meadows, then the two sections of flat land, comprising the thickly populated part of each village, and then the hills. The soil of Mill Plain is underlaid, with coarse, porous gravel down to the springs. That of Fairfield is underlaid in part with sand, and in part with loamy gravel, or in some places with hard pan. As you approach and rise to the hills, you meet spurs of rock, generally draining in lines parallel to the streams, and find a sandy, loamy soil mixed with coarse stones. My recollection of the physical condition of the locality goes back to 1840. Since then I have marked the changes by periods of years.

Commencing at the east, or Ash creek, in the past we found a tide stream of large volume, dammed at a distance of half a mile

from the mouth, and occupied by two large flouring-mills. The mouth opened at right angles with the beach, with a depth of water sufficient for sloops to go to the mills.

Now, we find the mills and tide-gates gone, the dams only existing as barriers to the proper flow of water, the creek gradually filling, the mouth no longer navigable, and the course of the stream turned parallel with the beach. Turning to Mill river on the west, we found a stream, forming at its mouth the harbor of Southport, occupied a short distance from the mouth by a tide-mill to which sloops could go, and about two miles above no less than four or five mills, all running. Now we find a harbor with difficulty kept open, the tide-mill running but seldom, and but one of the other mills in existence. The mill-ponds as a rule filled up with mud nearly to the surface of the water, and a constant accretion of mud in all parts of the river-bed.

Between the two streams mentioned there was Pine creek coming in from the Sound, with an open mouth, and furnishing a large volume of salt water for all the marshes of the village. In its wider parts, it had a width of 100 feet; as a boy I have crabbed from bank to bank with ample water at low tide for my boat. Now you find the old mouth closed by a large sand-bank, and the stream, making its way out parallel to the beach. The mouth is reduced in width, and in my opinion does not allow one-half the water to go in that formerly did. The channel is reduced in the wider parts to a width at low tide of twenty feet—the remainder being filled with mud on each side, scarcely covered at high tide. The portions of the creek where eel grass formerly grew as the mud has accumulated have become covered with a species of pest-weed. And in general, where formerly were wide ditches with abundance of water, you now find mud and but little water.

Drawing a line north through the middle of the village, you find the minor rills draining toward Mill river on the west, Pine creek on the west center, and toward Ash creek on the east center, and east, excepting those which drained into a pond called Hyde's pond, which lay on the west of the center line and which had no visible outlet.

The trees in this locality have increased largely in the past forty years. Then it would be called, perhaps, sparsely wooded, now almost densely wooded. In 1840 there was no railroad, and the hill-streams found their way without difficulty to their natural outlet. Now we find the railroad embankment cutting off many

of the streams with insufficient or filled up culverts, and in many instances no outlet provided. My remembrance of the health of the villages is that we had no thought of chills and fever, or malarial disease in any form. The growth of chills and fever has been gradual and increasing, until within the past two or three years it has been almost an epidemic. It has seemed to me that the atmosphere has entirely changed, during the summer it has been very oppressive and dank, producing a sensation of oppression to the whole system almost insupportable.

After our Centennial celebration, July 8, 1879, several gentlemen in the village of Fairfield, whose minds had been considering the faults of drainage of their section, and who appreciated the necessity of restoring by some means the character for health of our town, met together and resolved to form a Village Improvement Society. Under the auspices of that society the various works have been done. My own conclusions in regard to the subject were as follows :

1st. That in the mill streams the removal of the mills had taken away the flush necessary to keep them sweet, and free of mud banks. Hence the gradual filling of the mill-ponds, and the formation of mud banks in all parts of the stream.

2d. That in Pine Creek the neglect of the mouth, allowing it to close, and the neglect in not regularly cleaning the ditches, and the formation of obstructions to the outlet of the tide water, have caused an unhealthy accumulation of vegetable matter throughout the whole meadow surface.

3d. That depression of the surface formerly drained has been allowed by neglect to become filled up and stagnant.

4th. That other depressions have been caused by the running of the railroad across the foot of the hill, and by not in all instances providing proper outlets for the water.

5th. That time has made many places, formerly *not unhealthy*, now positively unhealthy by the gradual hardening of the under gravel.

(I have specimens of ground taken from some of my work where water has stood for many years, which are as hard as concrete, and entirely impervious to water.)

6th. That the increased number of trees has also caused places to become unhealthy which formerly were not so.

The works undertaken and completed, and which all bear upon my theory of the remedy for our difficulties, I will enumerate by number, and mark them on the map.

No. 1. A drain of 1,800 feet, to carry the water as it falls and runs from the neighboring hills, from the flat and depressed sur faces of Mill Plain to the river, instead of allowing it to stand and soak away into the ground, or to rise to such a height as to make

its way over gardens and under barns to the level of drain No. 2.

No. 2 is a short drain of 250 feet, carrying the water from the road and from a field where a pocket had formed of impervious ground, and where water lay until it evaporated.

No. 3 is a short drain of 300 feet, draining a hole (formerly, I am almost certain drained, although we found no evidence of it,) from which the surrounding inhabitants say a cloud arises so thick that it can almost be cut with a knife, and so offensive as to compel the closing of doors and windows.

No. 5 is the rebuilding of a bridge, and the lowering of its bed two feet and a half, so that the water flows out as low as the tide will permit it. This water way had filled up two feet and over, thus preventing the flow from all the ditches above to that extent. This creek is the upper part of Pine Creek, and receives into it the water from the hills back of Mill Plain, through the brook into which No. 2 drain empties, also the water from No. 6 drain.

No. 6 drains Hyde's Pond, and takes off all the water from a large section formerly under water in heavy rains and spring time. It is 1,500 feet long, and of 15 x 20 pipe.

No. 7 is a drain of some 1,800 feet, draining a bad hole (which was formerly drained, but entirely filled up,) and a large section of the back part of the village of Fairfield, next to the hills. This was a most important work.

No. 8 is a drain from the section of meadows lying between the center of the village of Fairfield and the Sound. In years gone by there was a creek putting up into this section of the town, and into it drained that part of the village around the churches and Court House. Time filled up the creek, and the drainage water made a pond called Reed's Pond. This is now successfully drained, and the adjoining land owners can continue the work of draining their own land.

No. 9 is a successful drain on a novel plan. The water is taken from the Meadows into a reservoir or catch-basin on the crest of the beach, and makes its way out by the natural passage through the sand. A tide trap prevents a flow of salt water backwards.

No. 10 is a drain from a depression in the hills in which the water had become stagnant.

No. 11 a long extent of drain pipe (some 1,800 feet), which relieves a hill section of surface and standing water.

You will thus see that we have done a large amount of work since September 1st. I am in hopes that more work will be undertaken next year, after the public mind becomes more aroused, and more attention is given to the study of the subject.

SICKNESS FROM IMPURE ICE.

The following data are very kindly furnished by Dr. Orlando Brown of Washington, Litchfield Co., under whose care the greater number of these cases were. The subject is a very important one, and all clear instances should be recorded, to prevent similar occurrences.

The town of Washington possesses the usual topographical features peculiar to Litchfield County, with perhaps less swamp land and stagnant water than the towns in the immediate vicinity. Thus far it has enjoyed complete immunity from malarial diseases, which is indeed the case with all but one or two towns in the county. There has been no epidemic form of disease of any kind for several years past.

The local conditions of the case are as follows:

The house is situated in a little valley among the highest hills of the region. The occupants were farming people of intelligence, the head of the family quite prominent in the public affairs of the town.

The family consisted of the man and his wife, aged respectively 51 and 46, the wife's mother, aged 69, two children—a boy of 12 and a girl of 14 years—a laborer employed on the farm, and a woman employed to do general housework. There had been no sickness in the family previous to August 6, 1879. The boy was then attacked apparently with a mild form of dysentery. There had been during the summer in different parts of the town here and there a few cases of dysentery, otherwise no unusual prevalence of intestinal diseases. The dejections were frequent of bloody mucous, without fæcal matter, tenesmus was marked, temperature never rose above 100, pulse about 104. August 7th the father became similarly affected, the dejections presenting the general appearance of beef brine. August 12th the daughter was attacked, being seized with a chill followed by a temperature of 105°, pulse 130–140, nausea and vomiting. August 12th the

grandmother was also affected, the onset similar to that of the girl.

Collapse came on as suddenly and as markedly as in Asiatic cholera. The girl died on the fifth day after seizure, the grandmother on the seventh, the boy on the ninth. The father, after a slow and tedious convalescence, recovered.

The mother and house servant had persistent diarrhœa, controlled with difficulty, but no dysentery. The farm laborer was early frightened, and left the town. No report of his illness was ever received.

The man that took his place went home at the end of a week, sick with dysentery, but recovered in about ten days. No cases occurred in his family or neighbors.

A sister of the wife that came to assist in the care of the sick was seized with dysentery, but recovered after six weeks' severe illness. Her children were ordered removed, but the two youngest, that were constantly with their mother during the day before removal, were attacked on the same day with a mild form of dysentery.

The cause was evidently local, the type of the disease once established mildly contagious.

The following facts as to the cause are obtained from the report of Dr. Raymond of Brooklyn, N. Y.:

Examination of the spring used to obtain drinking water excluded that as a possible source of the disease. The surroundings of the spring were unquestionably good, and analysis of the water as received in the house showed it to be of exceptional purity. The window curtain was examined for arsenic, but no trace of mineral coloring matter found.

The cellar was very damp, and the soil beneath and immediately adjoining the house damp from the free water supply brought into the house from the spring—five pints per minute. In case of heavy rains, water runs into the cellar through the rear wall. How much this water is contaminated from the privy vault is not easily estimated. The vault had not been emptied for twelve years, and was far from being full, hence there must have been considerable soil saturation, as the privy was constantly used.

The stream from which the ice suspected was gathered runs through a field along side the road. This field has for fifteen years been used as a running place for pigs, and swine were wallowing in the stream at the time it was examined.

The ice water on analysis showed:

Free ammonia, parts per million, - - -	.08
Albuminoid ammonia, parts per million, - -	.09

The water was of a greenish color, with light colored organic particles in suspension. The stream also apparently receives drainage from house waste, and possibly sewage from the privy-vault before mentioned. The analysis and general character of the ice water show sufficient cause for the production of the symptoms described. The ice water at Rye Beach contained considerably less ammonia.

Albuminoid ammonia is a reliable indication of contamination when excessive. When accompanied with but little free ammonia, and no evidence of chlorine, its presence indicates vegetable decay, the products of which contaminate the water. When the albuminoid ammonia amounts to .05 parts per million, the quantity of free ammonia that accompanies it must be considered in estimating the amount of contamination.* A large percentage of albuminoid ammonia may exist, .10 per million even, if there be no free ammonia present. The presence of the chlorides indicates contamination from animal decay, when present with the forms of ammonia. Taken together, the large percentage of both free and albuminoid ammonia in the ice water proves the excessive contamination of the water from which the ice was collected.

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* Wanklyn water analysis.

SANITARY

AND

UNSANITARY CONDITIONS

OF THE

SOIL.

BY

PROF. C. A. LINDSLEY, M.D.,

MEDICAL DEPARTMENT YALE COLLEGE, DECEMBER, 1879.

SANITARY AND UNSANITARY

CONDITIONS OF THE SOIL.

That "health is wealth," has become an accepted axiom: and hence the things which make for the protection and preservation of health are by the intelligent and considerate man put on a level in his regard with whatever helps him in the pursuit and possession of wealth. It is proposed in the following brief paper to consider how the health of people may be influenced by the conditions of the soil upon which they live and which immediately surrounds their dwelling-places.

The practical importance of fully appreciating the extent to which various conditions of the soil may influence the physical well-being of persons living over it, is becoming more and more recognized.

It has been observed almost from time beyond compute, that the health of men is influenced by those varying conditions which, in general terms, are called the influences of climate. But the careful study of the soil in its varying conditions, and of the pollution to which it is liable, as they are related to human health, has only in comparatively recent times received the systematic investigation to which its vast importance entitles it.

RELATION OF THE SOIL TO THE AIR AND TO WATER.

The popular mind has been content in the belief that some occult peculiarities of the *air* of different regions repair or impair, as the case may be, the health of those who breathe it. And they speak in a vague way of the air of this country or that as being *bracing* or *debilitating*. Pure atmospheric air is a fluid of a definite chemical constitution, varying chiefly in the amount of aqueous vapor it may contain and in its temperature.

Any peculiar influence which it may exert upon the health of men must therefore be attributed to the presence in it of some elements not native to its constitution. Whence does it acquire

these foreign elements? In any given locality it is possible that they may be brought from long distances, as they are transported by the winds; but the ultimate source or origin of them, it is reasonable to believe, must be found largely, if not wholly, in the earth at or near its surface.

It has been long recognized that the air of certain places is poisoned with an effluvia from the ground called *malaria*, but it has not been so generally understood that other deleterious agencies may have a like telluric origin.

It will be interesting, therefore, to inquire what relations the soil holds to the air; and also, because all the water consumed by man first descends from the upper air, and before it is used flows upon the surface of the ground or is filtered through it, the inquiry is scarcely less interesting respecting the relations of the soil to water.

The late Dr. George Derby said, "The well are made sick, and the sick are made worse, for the simple lack of God's pure air and pure water." This sentiment was not original with Dr. Derby, nor is the statement a novel one. More than four centuries before the Christian era the cardinal formula for health was announced by Hippocrates in these words: "Pure air, pure water, and a pure soil," and to-day we cannot improve it. Aye, even three thousand years ago the dangers of a polluted soil were fully recognized in the sanitary laws of Moses, from which it would appear that such abominations as our modern privy-vaults and cesspools were not tolerated in the camps of Israel. For we find recorded in the sanitary code to which they were subject in their journey through the wilderness, the following law:

"Thou shalt have a place also *without* the camp, whither thou shalt go forth *abroad;* and thou shalt have a paddle upon thy weapon; and it shall be when thou wilt ease thyself *abroad*, thou shalt dig therewith, and shalt turn back and cover that which cometh from thee."—Deut. xxiii, 12, 13.

It is proposed in what follows to set forth the danger of ignoring the qualities and conditions of the ground at and near its surface; and also to show how, by our own practices, we contribute largely to its defilement and interfere with or wholly prevent the processes which Nature, in her infallible wisdom, provides for its purification.

THE ACTIVITIES OF NATURE IN THE SURFACE GROUND.

The popular mind is wont to regard the poetic allusions to the absolute rest and silence of the grave as equally descriptive of everything beneath the sod.

A little reflection and the application of our common knowledge of facts will show us that a series of active processes are going on in the subsoil which, if we have not before observed them, will excite our astonishment. Instead of passive inaction, we find that Dame Nature is no less busy in her activities beneath the surface of the ground than she is above it.

If one will fill a pail with soil from the dryest part of the garden, he will find that when full of earth he can still pour into it a considerable quantity of water without causing it to overflow. In this case the water occupies the interstices between the particles of earth. One cannot pack the earth so closely but that such spaces will exist, and when they are not filled with water then the air will fill them. Again, it is well known that some animals, buried alive in the ground, continue to live for days, breathing only the air they can inhale from the ground itself. Even stones and rock contain air, and whether it be air or water in the ground, they are never stagnant, but always moving in currents up and down or to and fro, working their splendid chemistry in God's great laboratory.

They are always active, forming new combinations with whatever they may meet or dissolving old ones; oxidizing the products of decay and rendering them harmless, and generating vast volumes of carbonic acid for new vegetable life. So accurate, too, are the adjustments of Nature to her purposes and results that both animal and vegetable existence is preserved and maintained.

Notwithstanding that each day all the people in the world might be asphyxiated by the carbonic acid made in the soil, or poisoned by the noxious gases of decay, yet we are preserved from either calamity—on the one hand by the appropriation of the carbonic acid to the processes of vegetation, and on the other by the oxydizing action of the all penetrating atmosphere.

If now we expose the pail of earth and water for a few days to the rays of the sun, we shall find that the water has disappeared, and the air has again entered to fill the space it occupied. In this fact we have an illustration of another powerful element intimately concerned in the activities going on underground, namely, heat. Air, water, and heat are the chief factors of motion in the never-

ceasing unrest in the soil beneath our feet. Their influences upon each other are incessant and perpetual. The penetrating rays of the sun evaporate the water and give place to air, to a depth greater or less according to the degree of heat and its continuance. Thus ever changing relations of temperature, moisture, and ventilation are produced in the soil, due chiefly to the alternations of day and night and of the seasons, and to the porosity of the soil. There are therefore constant currents of radiant heat passing and repassing to a very considerable depth in the ground.

As a motive power, heat is unrivalled; even slight changes of temperature produce action. It is ever working; the elements obey its bidding in new combinations and decompositions and ferments.

THE GROUND WATER.

A scarcely less potent factor of action is found in the always varying presence of water near the surface. This, too, is in motion, not rapid, but yet always moving. The source of supply is the rainfall. From the clouds it descends upon the earth. The lesser portion—storm-water—flows upon the surface into streams, and thence onward to the ocean. A larger part is received into the ground. It is this we are interested to watch. It sinks down through the porous layers of loam, sand, and gravel until it reaches a stratum of rock or clay which is impervious. But as the surface of this water-proof stratum is not level, but is as undulating as the ground that covers it, reason and fact agree in finding the accumulated water below the point of saturation slowly moving onward, but in a lateral direction now, through the porous superstrata to some lower outlet. It does not stagnate. It is ever in motion, seeking its level, running in slow currents underground, usually towards some river or the ocean, in obedience to the same laws that control its less resisted progress on the surface.

What we call dry ground has much moisture in it, varying in quantity, with a varying amount of air, in all degrees to the point of water saturation. Below this point the ground is filled with water. If a pit is sunk below it, water fills the cavity and constitutes the familiar "well" in common use. The well proves also the fact, already mentioned, that the ground water is in motion; for no one believes that good well-water is stagnant water. It is also within the experience of all men that the water in wells rises and falls with the changing seasons; and many surface springs flow full or fail under like conditions. Thus we have incessant motion in the

soil water, following laterally the incline of the water-tight layer of clay or rock upon which it lies, rising and falling with the supply from the rain clouds. and always ascending through the ground towards the surface by the forces of capillary attraction to moisten the soil and supply the wants of vegetation.

THE GROUND AIR.

Above the level of the soil water the atmosphere enters, and plays its part in the unseen and noisless activities of the underground. This, too, is in motion; and constant currents of air permeate the soils passing through it in various directions, going in and out of it, and so by frequent interchanging with the upper air contribute the powerful influence of direct ventilation to sweeten and purify the surface soil.

The causes which produce motion in the ground air are diversities of temperature at different depths, the force of the wind, barometric pressure, displacement by rainfall and movement of ground water, and finally the law of diffusion which governs the action of all gases. The force with which the wind presses into the ground is apt to be under-estimated. A brief wind equals a pressure of over a pound to the square foot of surface, and a hurricane fifty pounds, and this upon a level and unobstructed surface; but if it blows against a hillside, or its current, turned against the ground by some resisting obstacle, the pressure is vastly increased.

How much then do we mistake the true character of the ground we live upon when we regard it only as an inert mass of loam, gravel, and stone. Heat, water, and air are always inseparable elements in its constitution. The conditions under which their ceaseless circulation goes on in the subsoil are not one whit less potent for good or evil to man than are the influences which affect his health above ground. The surface of the earth is the natural and necessary receptacle of all decaying and dead matter, of all worn-out material, of all forms of refuse dirt, and filth, of whatever kind or nature. If they remained where deposited in inert masses, unchanged and insusceptible of change, the accumulations would soon exceed all computation, and the surface of the earth would rapidly become occupied with them and be rendered uninhabitable. But Nature defeats this result, and secures the safety and maintainance of animal and vegetable life, and perpetuates the habitation of the earth, through the instrumentality of those energetic actions in the soil which are above described. Heat and moisture promote the speedy

decomposition of all organic matters, and the elements of which they are composed are variously appropriated. The gases of decay by the universal law of diffusion are evaporated and dissipated in the vast ocean of the outer air. Other elements are oxidized by the oxygen of the ground air, and still others are revivified through the mysterious processes of vegetation. Thus all, by the harmonious action of these various agencies are disposed of speedily, safely, and without waste in accordance with the economy of Nature. We observe then that the rain, the sunshine, the winds, and an active vegetation are the potent and all sufficient agencies by which the ground is purified and made a wholesome place for man to live upon.

MAN'S INTERFERENCE WITH THE INTERESTS OF NATURE.

This view of the subject leads directly to the practical query: Do our houses and homes harmonize or conflict with these natural hygienic processes? How does the ground upon which a city is built stand related to these grand operations of Nature?

In the first place, vegetation is destroyed and its potent energies in consuming the products of decay are lost. The surface of the ground is so covered that the influence of the sun-light and sun-heat is either altogether lost or greatly modified, and for the same reason the rain-fall reaches the surface in streams as it is shed from roofs and pavements, and therefore cannot difuse itself through it uniformly, and thus the condition of moisture is greatly changed, and the underground water courses are altered. Very often the result of such artificial inventions as the cesspool, the cistern, the privy-vault, and the cellar is to unite them together into a sort of system of underground drainage. Again, the soil is so completely covered by structures impervious to the air that the atmosphere is excluded, the winds are diverted in their course and the ground does not feel their pressure, and thus the purifying influence of underground ventilation is greatly interfered with or wholly prevented. The constant interchange of the upper and the ground air is impossible, and the latter becomes stagnant and corrupt. Such underground ventilation as is possible under such conditions is largely out of proportion into and through the cellars of dwelling houses. The stagnant air, contaminated with the gases of decay from the filth with which the ground is over-charged, is sucked through the cellars of houses as the most accessible permeable places of escape, and house poisoning is the inevitable result. That such is the fact

ordinarily, whenever the ground surface is rendered air-tight from any cause, has been often proved. It happened within the observation of the writer, a few years ago, that a main gas-pipe laid through the middle of a city street sprang a leak in a winter night, and the discharge of gas was so great that, not finding escape through the frozen ground, it permeated latterly through the soil under the air-tight frozen surface forty or fifty feet to the cellars of the houses nearest, and escaping there, so poisoned the air that the sleeping inmates were carried out of their houses in the morning by their neighbors, some of them in an unconscious state. Three houses were thus poisoned by the gas, and neither of them had ever had any pipe connections with the main pipe in the street. If the leak had occurred in the summer, when the ground was not frozen, it would have occasioned little or no annoyance to the families in those houses, because the escaping gas would have found its way directly to the upper air. But the incident illustrates satisfactorily the evils of sealing the ground about our homes with an air-tight covering, and leaving our cellar bottoms pervious to the passage of all the noxious gases generated in the filth-laden soil. And yet it is within the experience of most observing people to have seen a cesspool and a privy-vault sunk within a few feet of the house-cellar, and the ground all about them, and all the intervening space up to the house foundation, covered with an impenetrable coating of asphalt pavement. Where else can go the noxious gases that will invariably be generated in those filth-pits than directly to that graveled-bottom cellar? And what else can happen to the residents of that house than sickness and the sympathy of their neighbors for the mysterious dispensations of Providence? And so it is plain that by the erection of human habitations, whether collected in a city or isolated in the country, the natural relations of the surface-soil are necessarily altered.

The hygienic processes which Nature institutes for soil purification man interferes with or prevents. Nor only so, but heedless of the dangers of such interference, he aggravates and multiplies them by constantly storing about his home, in as close proximity to it as possible, the increasing accumulations of filth which the necessities of domestic life produce.

HOUSE-POISONING AND WELL-POISONING.

When a man provides a home for himself and his family, there are four things which he immediately does to the soil about it as

necessary, he thinks, to the appointments of his home. First he digs a cellar, over which he builds his house; next, he digs a well for the water; then he digs another excavation, not so deep as the well, into which he pours all the liquid filth of housekeeping; and finally he digs still another pit, and into this is daily dropped for storage the excremental discharges of all his family. These excavations are for convenience placed in close proximity to each other. Commonly a few feet, say fifteen to fifty, will measure their separation. Indeed, instances are frequent where one or more of these are included within another. I have known a house in the city of New Haven, occupied by two families, in which these arrangements were so *very convenient* that two cesspools and the well were all in the cellar, while two privy-vaults were only just outside the cellar walls, and they were all serving their special purposes daily, for both families.

This instance is not selected from the habitations of the ignorant and poverty-stricken. But as indicative of the intelligence and social position of the occupants of the house, they paid an annual rent of $1,000 for a dwelling only, which price it readily commanded because of its conveniences and its respectable location.

We would naturally ask how the underground currents of air and water may affect the water in the well and the air in a house so situated. What pleasant virtues does the well derive from the mingled fluids of those cesspools and privy-vaults between which it is so conveniently located? What invigorating and health-giving properties are imparted to the atmosphere by the fragrant exhalations which the warmth of the cellar extracts from its saturated bottom? Surely such questions require no formal answer. In illustration, however, of what happens under like conditions, I quote an abstract from a letter recently received from a physician in a neighboring town.

"I have a family under my care in which for some years past there has been a good deal of sickness. Of late it has in part assumed something of a malarial character—there has been some sore throat of a catarrhal nature, no diphtheria, but it has mostly assumed an indefinite type, slight fever, furred tongue, loss of appetite, and more or less prostration. The family occupy a fine place nicely located—surroundings neat, and at first sight sanitary conditions seemed to be all that could be wished. On examination, I found back of the house a cesspool, well, and privy-vaults.

The latter were both under a roof connected with the house. The privy-vault is nineteen feet from the well, and ten feet from the cellar. The cesspool is twenty-five feet from the well, and but eight feet from the cellar. It is tightly covered at the top, and has no ventilating pipe except that connecting it with the sink in the kitchen, in which there is no trap." He further states that *no unpleasant smell* has been observed in the house and they think the *water is excellent*, and concludes with asking naively if I "*should suspect any trouble from either of these sources.*" It seems impossible to doubt that house-poisoning must occur from such conditions without the demonstrative proof that the inmates of the house were so poisoned.

Another source of poisoning from unsanitary conditions of the soil is through the drinking of well-water. The purity of our wells from the filth dissolved in the rain water, as it passes through the ground to the wells, must depend wholly upon the filtering and purifying process of the soil itself. Fresh earth is an unrivalled filter. But this function depends greatly upon the freedom with which the air circulates within it, the purification being nearly in all cases a process of oxidation. A few feet of fresh earth under natural relations will remove all the color and odor from the foulest slops in the kitchen yard. And if time enough is allowed, and space enough through earth provided, it will effectually "transform the foulest and most noisome sewage-water into the crystal springs which poets celebrate in verse, and which even religion takes as the type of its best gifts to man." But there are limits to its purifying powers. It is possible, too, to destroy its qualities as a filter. What filtering power can the ground preserve in the back yards about our wells if we keep it saturated year after year with the sewage from our kitchens, and the excrement from our persons? Filled with the nastiest of filth, it is impossible that it should make the water that passes through it pure. It may indeed render it free from color and smell, but do not forget that *clear* water is not necessarily *pure* water. A city well may give no warning to any sense; its waters are refreshingly cool, they are clear and sparkling, free from all solid particles, without odor, and yet they may be laden with the germs of the deadliest pestilence. Such cases have happened a thousand times. In the cholera epidemic in London in 1866, one grain of sewage defilement to the gallon of water supply was found to be directly connected with over 70 per cent. of the whole mortality.

HOW WELLS ARE DRAINS.

Practical men know that land drainage is effected by cutting a ditch a few feet deep across the field to be drained, and that even in very compact soils a cut five feet deep will take the water from the adjacent ground to a distance of twenty-five feet on either side. So too, with a pit dug in the ground, the water from the surrounding ground would gravitate into it from as great a distance by the same law, although the operations of nature are not changed by the name we give to such a pit. Therefore, if we call it a well, and use it for a well, it still performs the functions of a drain all the same as if it was called a drain, and dug for a drain. The fact therefore cannot be disputed that *every well is a practical drain* in good working order, and takes the water of the surrounding ground from an indefinite distance in proportion to its depth, and the porosity of the soil. With this fact in mind it is not pleasant to think of the cesspools and privy-vaults within drainage distance of the wells that supply our drinking water.

WATER-TIGHT FILTH-VAULTS.

The dangers of well-poisoning and house-poisoning through the ground from these pits of pollution have so impressed the Boards of Health of some cities that they have ventured to anticipate the public intelligence on this subject, and enact laws requiring all underground reservoirs of filth to be made water-tight, and forbidding the construction of any more leaking cesspools and privy-vaults. As was expected, the enforcement of this law has met with decided opposition. It seems incredible that so many otherwise intelligent people should be so ignorant or reckless of the dangers of those soil pollutions, that they regard the law oppressive and wrong, simply because it involves some additional expense for more frequent emptying of such vaults, and removal of contents. The very objection itself is proof of the evils of loose walled vaults, and so of the need of such a law.

The objectors say in effect:—"We do not wish to have these filth-pits, at our back doors, tight—we like to have them leak; the more they leak the better. The more the filth about our houses soaks into the ground the better we like it, because then it don't cost us anything to carry it away." They do not count the cost of having typhoid fever, malaria, cholera infantum, diphtheria, etc., in their families. Yet a volume could be filled with demonstrative

proofs that these diseases and others have been engendered and propagated by exactly such soil pollutions.

WELL AND CELLAR CONNECTIONS WITH PRIVY-VAULTS AND CESSPOOLS.

Every city will afford hundreds of instances in which direct communication exists between these vile vaults and the well and cellar, to defile the water and pollute the air of the house. In the construction of one of the railroads running into New Haven a grade cut was made through a hill, and in one bank of the cut, when the writer last visited the spot, there might be seen several little streams of dirty water oozing through the ground from a cesspool more than fifty feet distance.

Where water goes one day it is more likely to go the next, and continual going in one direction soon establishes a channel of direct communication, so that in time all the liquids flow through it. This is frequently the fact when an outlet lower than the bottom of the cesspool exists, whether it be a railroad cut, or a well, or a house cellar.

Several years' experience as the health officer of New Haven has brought to the writer's notice many instances where such relations existed between the cesspool and the well. These were most conspicuous after the weekly washing day, when the water drawn from the wells, by its smell and appearance (I did not taste it) gave unequivocal evidence of being largely charged with the products of wash tubs after useful service in purifying the family linen.

THE SUBSOIL AS A FILTER.

It is quite certain we are disposed to put too much confidence in the purifying powers of the soil. There is not only a limit to its powers, but there are also conditions essential to its action as a purifier. The water of slops and sewage and human excrement buried near our wells will not be made pure and fit for drinking by filtering through a few feet of earth except under most favorable conditions. What are the conditions favorable to its purification? The great and most essential requisite is a free ventilation of the ground; instead of shuting out the air by an impenetrable covering, the utmost freedom of air circulation should be afforded. Because, as the chemists tell us, the air acts through its oxygen upon the impurities which the soil strains from the dirty water, and oxidizes or burns them. Again, it is obvious that to get the best

results as a purifier, the ground charged with impure liquids should have an interval of time between its wettings long enough to become so dry that the atmosphere may follow the receding liquids and destroy what the filter has strained from them. But if no interval for drying is permitted, if the ground is kept constantly wet to saturation, then it is quite certain the air cannot enter into it; the impurities are not oxidized but accumulate; the ground no longer acts as a purifier, but on the other hand the increasing quantities of filth incorporated with it takes on its own chemical action, and becomes prolific in the production of mephitic and poisonous gases, which ascend to upper air to work their unwholesome action upon all who breathe them.

It is easy to understand which of these conditions is maintained by these filth pits. The exudation from their bottom and sides is nearly constant; the intervals of supply are so regular and frequent that no opportunity occurs for the air to restore the filtering power of the soil. Thus the fouling process goes on, and after some weeks or months there is no clean earth between the well and these pestilential sources of supply to it, and every drop of water from them carries with it its atom of filth.

The most elegant and tasteful home that wealth and art could provide would be defective in the most essential quality if it was not also a *sanitarium.*

It is simply astonishing to observe what trouble and expense people will incur to provide themselves with what they call the comforts of a home, while at the same time they are so indifferent to unsanitary conditions, which will make their home most uncomfortable through the sickness and death which they cause.

If we could for a time enjoy the powers of vision which the clairvoyant professes to have, and could peer down into the subsoil about some of our homes, a revelation would be made which now we little realize. Unsuspected infiltrations of filth, obstructed drains, stagnant water, and stagnant air, subterranean channels radiating from wells and cellars to the various filth-pits by which they are surrounded, would meet our astonished eyes, while many odors of a fragrance not chosen by the perfumer for a toilet use would assault our disgusted noses, and so through our offended senses we might be convicted of living in more dangerous familiarity with filth than the brutes in their natural state.

This state of subsoil nastiness is almost wholly due to the leakings from the cesspools and privy-vaults with which the ground

in every old settled town is honey-combed. It is quite impossible to conceive any more scandalous imputation upon our domestic life than that we are frequent victims of infectious diseases, which we incur through the action of our own excrement, which our extreme filthiness permits to mingle with our air, and food, and drink. The dangers which attend the toleration of these subterranean reservoirs of foulness cannot be computed. Dr. John Simon, the great English sanitarian, writing on this subject, says, "The pathological studies of late years, including eminently certain very instructive researches which Professor Sanderson has conducted, have clearly shown that in the 'common' septic ferment, or in some ferment or ferments not hitherto to be separated from it, there reside powers of disease production as positive as those which reside in the varioloses and syphilitic contagia."

There is but little doubt in the minds of those who best understand the subject that if it were practicable to effect the prompt and complete removal of all excremental matters and all other organic wastes to such distance that we should have no further contact with them, there would simultaneously disappear from our midst certain of our most grave and fatal diseases, especially those of the intestines. We might also reasonably expect relief from malarial diseases which are, with remarkable unanimity of opinion, attributed to emanations from the ground. Unsanitary conditions of the soil are, however, not always due to human agencies. As the subject is better understood by systematic investigation, the fact is developed that in addition to those diseases which find their origin in soils polluted by man, there are also many other diseases the sources of which are found in various natural conditions of the earth's form and substance. The relation of the geology and the topography of places to the health of residents is a large study, and one which demands an extended and patient investigation. Our present knowledge of it is as yet only too general and indefinable to be thoroughly practical, but it is a field of inquiry which promises great results from a broad and intelligent exploration.

For more than a century the prevalence of malarial diseases has been associated in our experience with certain topographical conditions, but almost the sum of positive knowledge of their relations was comprised in the statement that some swamps cause malaria. More recent observations have shown that topography alone is not adequate to explain the etiology of the malarial types of disease :

that they are found to occur under the most varied conformation and character of surface, and that the deeper geological construction and direction of the strata of the earth's surface are intimately associated with their production. As a result of studying the relations of the soil to human health, one conclusion has been reached which may be considered as established, which is, that an excess of moisture in the ground is always unsanitary. There are abundant facts in proof, and the inquiries of Dr. Henry I. Bowditch some fifteen years ago, respecting the connection of wet soils with the prevalence of consumption in New England, have dispelled all doubt about it.

In the foregoing, the writer has had in mind chiefly to present what agencies Nature employs in the ordinary condition of the soil, to dispose safely of the decomposing organic matters, which everywhere may fall upon its surface, and which would otherwise become dangerous to health. In addition also to show to what extent the prevailing habits of domestic life interfere with the intentions of Nature, by preventing those salutary operations which keep the soil pure and wholesome; and how in the most reckless and criminal way we directly render the soil unsanitary and dangerous to live upon.

It is another branch of the subject to study the various conditions of natural soils, in their sanitary bearings, and one which involves a much wider field of inquiry. Its elucidation would call for detailed topographical and geological surveys of large areas, to be followed by equally careful sanitary surveys of the same areas. By the collective classification and comparison of the facts thus obtained, data would be furnished from which there is promise of deducing with reasonable certainty some of the principal causes of the most fatal prevailing diseases; and in that event of pointing out the practical remedies which will materially reduce the death-rate in communities.

There are quite satisfactory grounds for believing that the united results of topographical, geological, and sanitary surveys of extensive areas, carried out by expert and trained observers, acting in concert and by authority, would be the production of a body of facts from which might be determined most important laws of health. This is too great an undertaking for private enterprise, and can only be successfully pursued by governmental authority and aid.

SCHOOL HYGIENE.

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SCHOOL HYGIENE.

The value of any educational process or system is not tested by the proficiency acquired in its methods, nor by the degree of perfection reached in the prescribed course. Nor is it enough to prove the system a success that the utmost possible amount of knowledge and mental discipline have been bestowed within the limited time, unless the training has been in the line of developing a healthy maturity. The ultimate object sought is fitness for the labor of life, a symmetrical development of all the faculties, and such discipline as will enable one readily to acquire knowledge and skillfully to use it ; the ability to concentrate at once and at will all one's energies upon new facts, new ideas, and new situations. The age in which we live is fruitful in changes, and demands the power of ready adaptability to make the best of unfavorable circumstances and conditions and turn them to our advantage. Skill, effectiveness, and endurance should be the resultants,—a body trained to execute the mandates of the mind, as well as a mind trained to know and use its powers. As the body is the instrument or agent through which the mind must work, any system or process that weakens or enfeebles the body, inducing an inaptitude for manual labor, premature invalidism, lessened powers of resistance to depressing influences, and an imperfect organization, is in so far a failure. It is a grave and serious concern to the State that the large proportion of its population, in Connecticut about one-third, engaged in going to school should during the ten or twelve years thus employed, be surrounded by no avoidable unsanitary conditions and subjected to no influences that tend to induce imperfect physical or mental organization, to lower vitality, or to lay the foundation for disabilities in after life that shorten the limits of effective life work. This period included in school-life is the most impressionable, is indeed the formative period, and any depressing influences are much more effective here than during any other period. "The young lives are finer tests of foul air than the older and perhaps

acclimatized population." The capacity for resistance is in inverse ratio to the rapidity of growth.

A very much larger proportion of invalidism, ill health, disease, and death are due to bad hygienic influences than is commonly supposed. Damp houses, undrained premises, unventilated rooms, impure water, badly placed outbuildings, and carelessness in the disposition of the garbage and filth necessarily resulting from domestic life, have a closer and more intimate relation to ill health, disease, and death than is generally recognized. When these truths are realized and acted upon, the results soon make apparent the reality and value of sanitary laws. Although mankind are naturally careless, negligent, and inclined to procrastinate, still we find hygienic improvement to advance pretty regularly with the advance of knowledge and intelligence.

The State, in a certain sense, makes the children its wards, as education is rendered compulsory; hence not only should all preventable unsanitary conditions be removed, using the term in its widest sense to include both mental and physical relations, but should train the pupils in right methods of guarding life and health by obedience to sanitary laws, by which much inherited invalidism and evil tendencies may be obviated. The most decided results could be achieved by furnishing the essential requisites for a vigorous, healthy physical development and maturity, and conforming educational methods to physiological and hygienic laws. A vast amount of sanitary reform would be the necessary resultant of such a course. So far from this so desirable a state of affairs existing, it is unfortunately but too obvious that the reverse is the truer picture, and that the school-rooms in their present condition, and the prevalent systems of education, to say the least, imperil and endanger health.

The question then arises: can a symmetrical mental development and discipline be secured without infringing upon the conditions essential to a harmonious physical development and maturity? This involves the idea that brain-work is necessarily exhausting and depressing as compared with other forms of labor; the contrary, however, is the truth; exercise of the mind, if rightly directed, invigorates the body and conduces to health and long life by increasing the volume and vigor of the brain, the storehouse of energy for the whole system. Such exercise, however, must be suited to the age, development of the brain, and consequent mental receptivity of the child, must be regular, not unduly

forced, and must be kept free from worry and anxiety. In the young especially the evils of worry and anxiety are noticeable. By emulation, competitive study, or penalties, the active, impressible brain of the child is harassed and work becomes depressing. The studious, faithful, conscientious child, who needs restraint rather than the spur, is the one injured; the careless, unimpressible child, of exuberant animal life, who shakes off all care as soon as he leaves the school-room (if, indeed, there were any to shake off), for whose behalf these methods were resorted to, receives no injury, as he takes no heed. The results of the forcing system are a mental discipline that has its fruition in what should be its springtime, and a mental development that has reached its acme ere the educational process is completed. Such brains may be quick but are not productive, and are, as Kingsley says, "apt to mistake capacity for talk for capacity for action, excitement for earnestness, vehemence for force, and too often cruelty for justice." By physical culture is not meant special training in any one direction, which is indeed to be deprecated, as when a muscular oarsman finds he has developed a diseased heart, but that due attention be paid to that exercise of the different bodily structures essential to growth and development; that over-tension and cramping restraint be avoided, and the younger the children the more frequent the intermissions and varied the mental exercises.

Every occupation has its peculiar dangers and liabilities to ill, and the occupation of going to school is no exception. To a certain extent it violates the essential conditions of healthy child-life, which demand ceaseless change of position or restless activity, constant change of attention, and frequent periods of repose and sleep in case of the very young. This leads naturally to the first violation of physiological law in educational methods, which relates to the time for mental effort, the general law being that study and all mental work shall be adapted to the age, and not be in advance of development. The time selected by the physiologist and hygienist for the commencement of systematic education is when the child has reached seven years. This is not arbitrarily selected, but rests upon physiological laws that cannot be violated with impunity.

The source of mental energy is in the gray matter of the brain, and whatever may be the theory of mental action, the brain furnishes the conditions necessary for the manifestation of mind, and that through the gray matter. Now up to the seventh year

the brain, while growing at a more rapid rate than at any other period of life, is comparatively deficient in gray matter, but the white matter related to the perceptive faculties predominates. Up to this time, therefore, the perceptive faculties are sufficient to keep the mind fully occupied in acquiring the knowledge to be gained by observation. While the gray matter of the brain is but partially developed, mental effort involving the reflective faculties and abstract ideas should not be allowed. "All formal labor of the mind required before the seventh year is in opposition to the laws of nature, and will prove injurious to the organization." The superintendent of the schools in St. Louis states that children that enter the schools at eight years make nearly double the progress that those make that enter at five, and similar testimony might be cited indefinitely.

There are many physiological reasons for selecting this age for the commencement of regular education, the lower vertebræ of the spine, upon which the upper portion of the body rests when in a sitting position, are then ossified and not before. The proportion between the upper and lower portions and the trunk is reached during this year. During the seventh year the body commences to have a uniform, steady growth; before this period different portions increase with different rates of growth.

The rapid growth of the brain implies an increased blood supply, and explains the greater nervous susceptibility of children The nervous system in childhood, besides presiding over the functions that maintain life and provide for the repair of the daily waste of tissues, as in adults, has in charge those of growth and development, *i. e.*, the production of new functions, and the mechanism for their exercise. Now if its energies be unduly taxed in mental labor, it draws upon those which should be reserved for digestion and assimilation; these processes being interrupted, the brain is no longer supplied with nutritious blood, and development is checked or perverted. The reserve force is much less in childhood, as it is required for the processes of development. The process of repair in the brain takes place only in sleep, as well as its growth, hence a greater amount of sleep is required and at more frequent periods than in the adult. If denied, nervous irritability results, followed by exhaustion or depression. This nervous irritability and its expression are too often considered as requiring and receiving punishment, as it leads undoubtedly to infractions of discipline. There is one other point in this connection: the constant

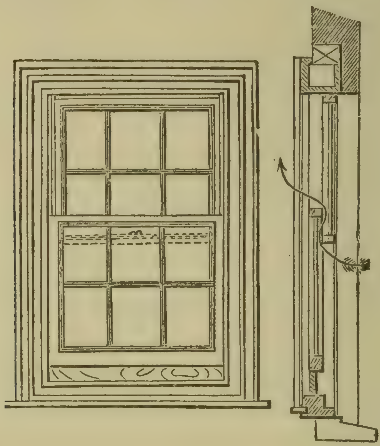
effort to accomplish a task that is beyond the mental powers weakens the brain and injures mental capacities permanently.

One of the most essential requisites, however, for a healthy and vigorous physical development is one but poorly supplied by the average school room, and that is pure air. This is essential to good mental labor, to work that shall task the powers of the brain to the utmost, and at the same time invigorate and strengthen it, and indirectly the physical frame.

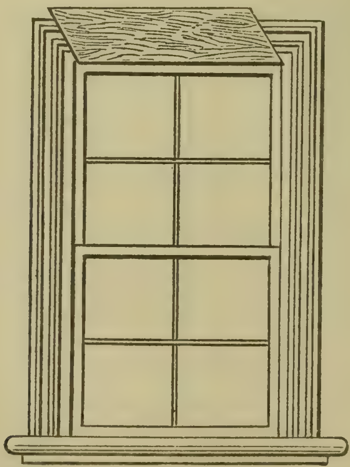
Children breathe with nearly double the rapidity of adults, and hence are more susceptible to the ill effects of impure air. It is claimed by some that small children do not require so much air space as the older, but this is erroneous, as the rapidity of breathing compensates for the smaller volume of air respired. At each breath we inhale carbonic acid, twenty-five to forty ounces, every twenty-four hours, we exhale watery vapor, and fetid organic vapors, the products of changes that have taken place in the system; these latter give the offensive smell to a close, ill-ventilated room when occupied. The air is also contaminated by exhalations from the skin, and by emanations from soiled clothing; the latter no small item in a crowded room. The dust of the school room is peculiar, the fine particles of chalk from the crayons used at the blackboards constitute a special impurity; imperfect janitorship often adds others from the accumulation of several days, around the desks.

The use of windows to ventilate the school-room during the session, is very objectionable, as the sudden exposure to a draft of cold air "slays like the stroke of a sword," while the impure air produces ill health and undermines the vital forces more slowly. The following illustrations show two methods easily available, that can be arranged at slight expense where the authorities cannot be prevailed upon to ventilate the building systematically. A strip, the length of the window-frame and width of the opening, should be placed under the lower sash. This should be as thick as the lower sash, and well fitted to its place. The lower sash is raised, this strip put in place, and the sash shut down, resting upon the strip. The air now enters between the two sashes, and is given an upward direction, thus avoiding a draft,—the direction is indicated by the arrows in the side section. The other plan is to nail or fasten securely a strip of board at a sharp angle to the top bar of the upper sash, and then lower the sash. This, of course, should be of the length of the sash, the width determined by the volume of air desired. More

air is admitted by this method, an upward direction is given to it, and direct draft avoided. By these means the air supply can be



much improved. A test for the carbonic acid, which is a fair measure for all the impurities, is easily made. The normal pro-



portion in air is eight parts in ten thousand. To test for excess, take an eight-ounce vial, fill with rain water, preferably, and empty

out the water in the room the air of which you wish to examine. As the water flows out, air passes in, and the bottle becomes filled with the air of the room. Pour into the bottle half an ounce of clear lime water, obtained easily at any druggist's; cork, and shake thoroughly. If no milkiness or turbidity results, the air does not contain more than eight parts carbonic acid in ten thousand of air. If a six-ounce bottle is used, with half an ounce of lime water, and gives turbidity, there is eleven parts carbonic acid in ten thousand of air. If a two-ounce bottle show turbidity, it would indicate over forty parts instead of eight. Thus the quality of the air can be tested. Lime water can be obtained from any druggist, or easily made. Pour cold water over unslacked lime; let it stand over night; then carefully pour off the clear water. More water can be added to the lime, as only a certain per cent. is dissolved. This is a fair test of the quantity of impurity in the air, although there are many deleterious substances that are not indicated at all by the proportion of carbonic acid. Ammonia is tested for by a paper prepared as follows: Evaporate tincture of logwood to dryness; dissolve the residue in ether; dip strips of filtering paper in this. Ammonia gives these strips a brownish tint. Sulphuretted hydrogen is best detected by strips of filtering paper, dipped in a solution of sugar of lead, and exposed, *wet*, to the air of the room. The gas turns the paper black. The test is a very delicate one; very small quantities are detected. The absence of ozone in the air indicates a large percentage of organic matter. Hozeau's test is as follows: Soak litmus paper of a neutral tint in a dilute solution of iodide of potash. The ozone sets the potash free, which turns the paper blue. A person can become habituated to the endurance of a vitiated atmosphere,—a process which, while it trains a child to live on impure blood, trains him to live a poorer and feebler life.

QUANTITY OF AIR REQUIRED.

To preserve the air in a reasonable degree of purity, from 200 to 300 cubic feet of air space and 25 sq. feet of floor space are required for each schoolar. This is based on exact mathematical calculations of the amount of air devitalized, and implies constant change by ventilation. As the smaller children breathe with greater rapidity, their requirements are about the same. In the worst examples in this State I found 4½ square feet floor space, and less than 50 cubic feet air space, and no systematic ventila-

tion. It is only in the buildings lately constructed that this standard is nearly reached, usually in the cities. The evils of impure air are too well known to require discussion; the statement is enough. In England and Wales the excess of deaths in the school stages of life amounted, upon examination, a few years since, to fifty thousand annually. These, to a greater or less extent, are chargeable to the unsanitary relations of school life.* The evil of over-crowding is a common one in all States, especially in cities.

The discussions concerning the New York City Schools furnish a striking commentary on this point. The subject is very comprehensive, and I hope to discuss it more fully later. There are, however, several points that can well be presented in a preliminary paper like this. Dyspepsia, sleeplessness, headache, nervous irritability, neuralgia, and general depression are some of the evil results of overtasking and bad ventilation.

HEATING.

Nearly as imperfect a condition often exists with reference to heating as to air supply. Sudden excesses of heat, and then exposure to direct draft from open windows, and the contamination of the air by carbonic oxide and other gases, are prevalent evils. The dryness of the air constricts the depth of inspiration, and predisposes to lung disease. Virchow attributes most of the pulmonary diseases of children to over-crowded rooms, changes of temperature in passing from hot rooms to cold stairways or the outer air, to the dust of the school-room, and the impaired respiratory movements induced by prolonged sitting.

One of the best desks I have seen is that in use in the Chauncey Hall School, Boston. The desk is at an angle of 23° for writing, and so constructed that it comes within an inch of the body. The lower section turns back with a noiseless sliding joint, making a book-rest at an angle of 45° for reading or studying. The interior of the desk is open to inspection when the lower section is folded back, affording no chance for books or slate to drop, or for untidy desks. The seats were arranged with reference to the natural curves and outlines of the body, preventing pressure on the large nerve of the limbs, which is a common fault and produces sciatica. A most excellent rule obtains here, the neglect of which has been productive of much life-long ill health: the intermediate pupils

* Chadwick on Sanitation in School Stages of Life.

are sent to the highest floors instead of the older pupils. The recommendation is most emphatically urged that this wise course be adopted in those buildings that have several pairs of stairs to climb. The pelvic derangements that are caused by this excessive stair-climbing have in many instances destroyed health for life. While the construction of lofty school buildings is to be condemned in a sanitary point of view, one great evil may be thus partially prevented.

DESKS.

The matter of seating scholars and the height, size, and adaptation of the desks to the requirements of the scholar should be considered. The following table is by Dr. Guillaume—11 Swiss inches being equal to 13 English inches.

Height of pupils.					Desk.	Seat.	Back.
feet.	inches.		feet.	inches.	inches.	inches.	inches.
3	6	to	3	9	15.8	9.5	11.9
3	9	"	4	2	17.0	10.3	12.9
4	2	"	4	5	18.1	11.2	14.0
4	5	"	4	8	19.2	12.2	15.0
4	8	"	5	1	20.4	13.1	16.1
5	1	"	5	4	21.6	14.1	17.2

EYE DISEASES.

The increase of near-sightedness is marked in America as well as in Germany and other countries. The evil is caused by a faulty management in lighting the building, faulty desks, imperfect light or too intense. The direction of the light is also of great importance ; too often the pupils receive light directly in their faces, or cross lights; the black boards, too, are often imperfectly lighted. The size of the windows should bear a direct proportion to the floor-space, from one-quarter (Burnett) to one-sixth (Lincoln) of the floor-space. It is best to have the light come in from behind, next best from the left side. Light gray tints are the best for the interior walls.

CONTAGIOUS DISEASES.

A large class of diseases that are peculiar to childhood belong to the communicable or infectious class, hence the propriety of closing schools upon the appearance of anything like an epidemic. Carelessness in this respect has often been productive of the greatest evils. A still greater protection would be afforded if physicians

were obliged to report to the Health Board of the city all cases of malignant communicable disease. This is done in Brooklyn, N. Y., Boston, Mass., and some other places. Those infected might then be restrained from going to school, or to any places of public resort, and thus from becoming carriers of contagion. Epidemics of diphtheria have in many instances been spread through the medium of schools, the patient often returning before danger of communicating the disease was over.

This paper is presented to prepare the way for a more complete presentation by a brief statement of some of the more salient points. The school system of this State is so excellent that greater confidence is felt in discussing those points where, as in common with all, improvement can be made. The Kindergarten methods advocated by the State Board of Education, recognize the relations of mental culture to brain development. The Quincey methods are also based upon these principles.

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The State Board of Health does not hold itself responsible for statements and opinions in any article unless such statements have been indorsed by a special vote.

State Board of Health.

BUREAU OF VITAL STATISTICS,

STATE OF CONNECTICUT.

REGISTRATION REPORT

FOR THE

Year Ending December 31, 1878.

NEW SERIES.—NO. 1.

Printed by Order of the Legislature.

HARTFORD, CONN.:
PRESS OF THE CASE, LOCKWOOD & BRAINARD COMPANY.
1879.

State Board of Health

AND BUREAU OF VITAL STATISTICS.

State of Connecticut.

Office of the
Superintendent of Registration of Vital Statistics,
State House, Dec. 1, 1879.

To his Excellency, Charles B. Andrews,
Governor of the State of Connecticut:

Sir: In conformity with the requirements of the laws of this State, I have the honor to submit the Annual Report relating to Births, Marriages, Deaths, and Divorces occurring in Connecticut in the year 1878, from the reports returned according to law from the several towns.

The compilations from the original returns, and the laborious mathematical work involved in the construction of the tables indicating the varying influences of age, sex, season, locality, and nationality, with the requisite protracted attention to details necessarily implied in such work, have been performed in this office by the Superintendent of Registration without recourse to expenditure for clerical aid.

The assistance of Dr. C. W. Page of Hartford, especially in the second series of tables, is gratefully acknowledged.

It is hoped that the facts contained in these returns have been presented and discussed in such a way as to render the lessons they convey plainly intelligible and practically useful.

Very respectfully,

C. W. CHAMBERLAIN, M.D.,
Secretary State Board of Health and
Superintendent of Registration of Vital Statistics.

REGISTRATION REPORT,

1878.

The present is the first Report issued under the direction of the State Board of Health, to which is given the general supervision of the State system of registration of births, marriages, and deaths. The returns for the year were made to the Board, but direct supervision was exercised only during the last six months of the year. The subject of registration was very fully discussed by Dr. Lindsley in the Sanitary Report. By a modification in the law, prompt returns are now secured generally in the cities, and to considerable extent throughout the State. It is impossible to secure completeness and accuracy when the returns are made to the registrar only at the end of the year, as certified by the compilers of the ninth census and all statisticians. Even if the number be nearly complete, the cause of death, or other important facts, will be incorrectly stated, if at all. There is a field for constant effort for some time to come in improving the completeness and accuracy of the returns. The success already achieved affords encouragement for the future; the progress appears to be of a permanent and enduring nature, and the measures have the support of the intelligent and thoughtful. Of the importance to the State of complete public records in this department no argument is needed, as it is by this means alone that much that is essential to the successful management of public affairs can be learned. The protection of individual rights, the prevention of crime, and the interests of public order and morality, as well as the advancement of healthy living, and thereby prosperity as well as longevity, are thus secured. One of the most important sanitary laws thus derived is stated by Dr. Bowditch in two propositions :

1st. A residence on or near a damp soil, whether that dampness be inherent in the soil itself, or caused by percolation from adjacent ponds, rivers, meadows, marshes, or spongy soil, is one of the

principal causes of consumption in Massachusetts, probably in New England, and possibly in other portions of the globe.

2d. Consumption can be checked in its career, and possibly, nay, probably, prevented in some instances by attention to this law.

The application of this law to England and other lands has since been demonstrated. The control over the development of epidemic diseases like cholera and small pox, the powers of quarantine, and indeed not only does our knowledge of sanitary laws and all progressive gain rest upon a statistical basis, but also much of our progress in medical knowledge, if not all real gain in the power over disease.

In the present report the statistics of the year 1878 are presented, in relation to age, sex, and season, and, as far as may be, locality and nationality. As the results of the coming census will be available for our next report, many comparative statements can more profitably be then discussed. It is to be hoped that hereafter we may have a census once in five years, as the population, especially of the manufacturing centres, is so mutable that no system of estimates will give uniformly satisfactory results.

During the year 1878 there were 13,499 births, 4,285 marriages, 9,352 deaths, and 401 divorces. The number of registered births was less than in 1877 by 378. The number of registered marriages by 24. The number of registered deaths by 344. The number of divorces by 26.

The increase of births over deaths is 4,135, which is 241 less than in 1877, and somewhat less than the average for the last ten years. The sanitary history for the year, on the whole, does not give a favorable showing, and special causes will be analyzed later. One singular feature is the large number, comparatively, of sudden violent deaths. The tornado in Wallingford killed 30, the railroad accident at Tariffville 12, the steamboat explosion at Norwalk 12. These contribute to swell the totals from accident and violence.

The daily average of natural increase was 11.3.

Daily average of births, 19 m., 18 f., 37.

Daily average of marriages, 11.2.

Daily average of deaths, 25.6.

There were 221 colored births, five less than in 1877; 80 marriages, 16 less than in 1877; 240 deaths, one hundred *more* than in 1877, and 19 more than the births reported. The following table shows these statistics by counties:

VITAL STATISTICS OF COLORED POPULATION.

Counties.	Births.				Marriages.	Deaths.			
	M.	F.	N. S.	Total.		M.	F.	N. S.	Total.
Hartford,	23	19	4	46	18	25	30	2	57
New Haven,	32	38		70	30	37	42		79
New London,	10	12		22	13	15	15		30
Fairfield,	28	13	1	42	3	24	17	1	42
Windham,	5	6		11	6	4	3		7
Litchfield,	11	5		16	4	5	6		11
Middlesex,	4	5		9	3	1	9		10
Tolland,	1	4		5	2	3	1		4
Total,	114	102	5	221	80	114	123	3	240

There were 401 divorces granted in 1878, a less number than for many years. The following tables were reported by the State Librarian:

DIVORCES, 1878.

	Husband's Petition.	Wife's Petition.		Total in 1877.
Hartford,	27	47	74	72
New Haven,	28	83	111	97
New London,	11	41	52	44
Fairfield,		51	74	92
Windham,	10	18	28	35
Litchfield,	7	16	23	36
Middlesex,	3	15	18	23
Tolland,	6	15	21	28
Total,	115	286	401	427

CAUSE.	Hartford Co.	New Haven Co.	New London Co.	Fairfield Co.	Windham Co.	Litchfield Co.	Middlesex Co.	Tolland Co.
Absence, - - -								
Adultery, - - -	10	16	6	15	5	3	2	1
Infamous Crime, - -								
Cruelty, - - - -	15	20	14	16		3	6	8
Desertion, - - -	24	42	9	57	10	14	5	6
Fraudulent Contract, -				1		1		
Intemperance, - -	15	36	16	26	7	4	3	8
Misconduct, - - -	10	36	7		6	2	6	1
Life Imprisonment,								

The classification of causes is liable to the same imperfections as before, in that several causes are often assigned instead of one, and often of equal importance. The repeal of the so-called omnibus clause and other changes in the divorce laws, may have a tendency to decrease the number of divorces.

The nomenclature of diseases adopted in 1877 is followed with some slight variations, as it is the one most commonly in use at the present time, and renders comparative results more easily ascertainable, as well as secures the general advantages of uniformity. The tables will, it is hoped, aid in obtaining a better attention to details in the returns, as their relation to the facts required by the certificates is apparent, and also the value of these facts in giving a complete abstract of the vital history of the year and the manner each class and interest is affected by these annual changes and movements.

The greatest deficiency exists in the returns of occupations, and it is hoped that greater attention will be paid to this subject by registrars and those whose duty it is to make the returns. The relations of occupation to disease are extremely important as well as interesting; a brief analysis of the proportion returned will give some idea of the value of complete returns upon this subject.

CAUSES OF DEATH.

TABULAR LIST.

CLASS I. ZYMOTIC DISEASES.

ORDER I.—*Miasmatic.*

I. 1.—1. Smallpox, ...
2. Measles, ...
3. Scarlet Fever, . . .
4. Diphtheria, ...
5. Quinsy, ...
6. Croup, ...
7. Whooping Cough, . . .
8. Typhoid (and Infantile) Fever,
9. Erysipelas, ...
10. Puerperal Fever (Metria), .
11. Carbuncle, ...
12. Influenza, ...
13. Dysentery, ...
14. Diarrhœa, Cholera Morbus,
15. Cholera Infantum, . . .
16. Cholera, ...
17. Intermittent Fever, . .
18. Remittent Fever, . . .
19. Typho-Malarial Fever, . .
20. Rheumatism, ...
21. Cerebro-spinal Meningitis, .

ORDER 2.—*Enthetic.*

I. 2.—1. Syphilis, ...
2. Stricture of Urethra, . .
3. Hydrophobia, ...
4. Glanders, ...

ORDER 3.—*Dietic.*

I. 3.—1. Privation, ...
2. Purpura and Scurvy, . .
3. Delirium tremens, } (Alcohol-
4. Intemperance, } ism), . .

ORDER 4.—*Parasitic.*

I. 4.—1. Thrush, ...
2. Worms, &c., ...

CLASS II. CONSTITUTIONAL DISEASES.

ORDER 1.—*Diathetic.*

II. 1.—1. Gout, ...
2. Dropsy and Anæmia, . .
3. Cancer, ...
4. Noma (or Canker), . .
5. Mortification, ...
6. Leucocythæmia, . . .

SUPPLEMENTAL LIST
Of Diseases of Special Character (or Synonymes).

I. 1.—1. Vaccination not stated.
Smallpox (2d attack).
After vaccination.
Erysipelas, etc., after vaccination.
Chickenpox.
Miliaria.
2. Rubeola.
3. Angina maligna.
5. Mumps.
Tonsillitis.
8. Typhus fever.
9. Phlebitis.
Pyemia.
Hospital gangrene.
Erythema.
10. Childbed fever.
11. Anthrax.
17. Malarial fever.
18. Yellow fever.
20. Rheumatism with pericarditis, or disease of heart.
21. "Spotted fever."

I. 2.—1. Gonorrhœa.
Purulent ophthalmia.
4. Malignant pustule.
Necusia (usually from dissection wounds).

I. 3.—1. Want of breast milk.
2. Rickets.
Bronchocele.

I. 4.—3. Porrigo.
Scabies.
Tape-worm.
Hydatids.
Trichiniasis.

II. 1.—3. Soft cancer.
Sweep's cancer.
Melanosis.
Other kinds of cancer.
Polypus (part not stated).
Lupus.
5. Bed-sore.
Dry gangrene.

CAUSES OF DEATH.—*Continued.*

TABULAR LIST.

ORDER 2.—*Tubercular.*

II. 2.—1. Scrofula, ...
2. Tabes Mesenterica, . . .
3. Phthisis (Consumption, Tubercular), .
4. Hydrocephalus, . . .

CLASS III. LOCAL DISEASES.

ORDER 1.—*Nervous System.*

III. 1.—1. Cephalitis, ...
2. Apoplexy, ...
3. Paralysis, ...
4. Insanity, ...
5. Chorea, ...
6. Epilepsy, ...
7. Tetanus, ...
8. Convulsions, . . .
9. *Brain Diseases,** . .
10. Meningitis, &c., . . .

ORDER 2.—*Organs of Circulation.*

III. 2.—1. Pericarditis,† . . .
2. Aneurism, ...
3. *Heart Diseases,*‡ . .
4. Valvular disease, &c., . .
5. Embolism, ...
6. Phlebitis, ...

ORDER 3.—*Respiratory Organs.*

III. 3.—1. Epistaxis, ...
2. Laryngitis, ...
3. Bronchitis, ...
4. Pleurisy, ...
5. Pneumonia, ...
6. Asthma, ...
7. *Lung Diseases,*‡ *&c.,* . .

ORDER 4.—*Digestive Organs.*

III. 4.—1. Gastritis, ...
2. Enteritis, ...
3. Peritonitis, ...
4. Ascites, ...
5. Ulceration of Intestines, .
6. Hernia, ...
7. Ileus, ...
8. Intussusception, . . .
9. Stricture of Intestines, .
10. Fistula, ...
11. *Stomach Diseases,*‡ *&c.,* . .
12. Colic, ...

SUPPLEMENTAL LIST.

II. 2.—1. Psoas (lumbar) abscess.
Hip joint disease.
White swelling.
Cretinism.
2. Tubercular peritonitis.
3. Hæmoptysis.
4. Tubercular meningitis.

III. 1.—1. Phrenitis. Myelitis.
4. Monomania.
Fright.
Grief.
Melancholia.
Rage.
6. Hysteria.
8. Laryngismus stridulus
9. Neuralgia.
Ophthalmia.
Otitis.
Dis. of spinal marrow.
Necrencephalus. (Softening of Brain.)

III. 2.—1. Carditis.
Endocarditis.
3. Hypertrophia.
Angina Pectoris.
Syncope.
Arteritis.
Hydropericardium.

III. 3.—2. Œdema glottidis.
4. Empyema.
Hydrothorax.
Diaphragmitis.
Pneumothorax.
5. Pulmonary apoplexy.
Pleuro pneumonia.
6. Grinders' asthma.
Miners' asthma.
Emphysema.

III. 4.—1. Glossitis.
Stomatitis.
Pharyngitis.
Œsophagitis.
5. Perforation of—
6. Congenital.
Femoral.
Inguinal.
Scrotal.
Umbilical.
Ventral.
7. Constipation.
11. Dyspepsia.
Pyrosis.

*Other diseases of the brain, or diseases of the nervous system, *not otherwise distinguished,* are referred to this head. *Mutatis mutandis,* the note applies to the corresponding heads in other Orders of this Class.

† [See also I. 1.—19.]

‡ See Note under III. 1.—9.

CAUSES OF DEATH.—(*Continued.*)

TABULAR LIST.	SUPPLEMENTAL LIST.
CLASS III.—(Continued).	
12. *Pancreas Disease,‡ &c.,*	Gastralgia. Hæmatemesis. Melæna. Hæmorrhoids.
13. Hepatitis,	
14. Jaundice,	
15. *Liver Disease,‡ &c.,*	14. Gall-stones. 15. Cirrhosis.
16. *Spleen Disease,‡ &c.,*	
ORDER 5.—*Urinary Organs.*	
III. 5.—1. Nephritis,	III. 5.—3. Albuminuria. 6. Cystirrhœa. 7. Diuresis. Hæmaturia. Dis. of prostate. Dis. of bladder.
2. Ischuria,	
3. Nephria (Bright's disease),	
4. Diabetes,	
5. Calculus (Gravel, &c.),	
6. Cystitis,	
7. *Kidney Disease,‡ &c.,*	
8. Uræmia,	
ORDER 6.—*Generative Organs.*	
III. 6.—1. Ovarian Dropsy,	III. 6.—1. Ovarian tumor.
2. *Disease of Uterus,‡ &c.,*	2. Hysteritis (inflam'tion of womb). Metritis. Uterine tumor. Polypus uteri. Orchitis. Hydrocele.
ORDER 7.—*Organs of Locomotion.*	
III. 7.—1. Arthritis,	III. 7.—1. Ostitis. Periostitis.
2. *Joint Disease,‡ &c.,*	2. Fragilitas ossium. Mollities ossium. Caries. Necrosis. Exostosis.
ORDER 8.—*Integumentary System.*	
III. 8.—1. Phlegmon,	III. 8.—1. Abscess (part not stated). Boil. Whitlow.
2. Ulcer,	
3. *Skin Diseases,‡ &c.,*	3. Roseola. Urticaria. Eczema. Herpes. Pemphigus. Ecthyma. Impetigo. Psoriasis. Ichthyosis. Tumor (part not stated).
CLASS IV. DEVELOPMENTAL DISEASES.	
ORDER 1.—*Developmental Diseases of Children.*	
IV. 1.—1. Stillborn,	
2. Premature Birth and Infantile Debility,	IV. 1.—2. Atelectasis.
3. Cyanosis,	
4. Spina Bifida,	
5. Other Malformations,	5. Anus imperforate. Cleft palate. Idiocy.
6. Teething,	
7. Trismus nascentium,	

‡ See Note under III. 1.—9.

CAUSES OF DEATH.—*Concluded.*

TABULAR LIST.	SUPPLEMENTAL LIST.
ORDER 2.—*Developmental Diseases of Women.*	
IV. 2.—1. Paramenia, ...	IV. 2.—1. Chlorosis. Climacteria. Menorrhagia.
2. Childbirth. (*See* Metria I. 1.–9.)	2. Miscarriage. Abortion. Puerperal mania. Puerperal convulsions. Phlegmasia dolens. Cæsarian operation. Extra-uterine fœtation. Flooding. Retention of placenta. Presentat'n of placenta. Deformed pelvis. Breast abscess.
ORDER 3.—*Developmental Diseases of Old People.*	
IV. 3.—1. Old Age, ...	
ORDER 4.—*Diseases of Nutrition.*	
IV. 4.—1. Atrophy and Debility.	
CLASS V. VIOLENT DEATHS.	
ORDER 1.—*Accident or Negligence.*	
V. 1.—1. Fractures and Contusions,‖ .	V. 1.—1. Railroad accidents.
2. Wounds, ...	
3. Burns and Scalds, . .	
4. Poison, ...	
5. Drowning, ...	5. Lost at sea.
6. Suffocation, ...	6. Asphyxia. Strangulation.
7. Otherwise, ...	7. Exposure. Cold water. Frozen. Heat. Lightning. Surgical operation. Neglect.
ORDER 2.—*In Battle.*	
ORDER 3.—*Homicide.*	
ORDER 4.—*Suicide.*	
V. 4.—1. Wounds, ...	
2. Poison, ...	
3. Drowning, ...	
4. Hanging, ...	
5. Otherwise, ...	
ORDER 5.—*Execution.*	
V. 5.—1. Hanging, ...	
V. 6.—Violent Deaths, not classed ("casualty"), . . .	
Sudden, cause unascertained, .	

NOTE.—Cases of "infantile fever" are classed with relapsing fever, under one name, "typhoid fever." Cases of "rheumatic fever" are classed with "rheumatism;" of "hemorrhage," and "abscess," with the diseases of the organs affected. Cases of death from cold, heat, drinking cold water, lightning, surgical operation, and exposure, are placed under "Otherwise" [V. 7]. As "stricture of the urethra" is almost invariably the result of gonorrhœa, it is classed as I. 2.—2. Gastric fever is classed under Gastritis.

‖ Including "Railroad Accidents."

TABLE 1.

BIRTHS, MARRIAGES, AND DEATHS IN THE SEVERAL TOWNS, FOR THE YEAR ENDING DECEMBER 30, 1878.

HARTFORD COUNTY.

TOWNS.	Population in 1870.	BIRTHS.									MARRIAGES.								DEATHS.						
		SEX.				PARENTAGE.													SEX.				NATIVITY.		
		Male.	Female.	Unknown.	TOTAL.	American.	Foreign.	For. Husband, Am. Wife.	Am. Husband, For. Wife.	Unknown.	Both American.	Both Foreign.	For. Wife, Amer. Husband.	Amer. Wife, For. Husband.	Unknown.	TOTAL.	Both non-resident.	Hus. non-resident.	Male.	Female.	Unknown.	TOTAL.	American.	Foreign.	Unknown.
HARTFORD	37,743	496	390	..	886	339	395	53	64	35	223	76	23	41	3	366	13	32	385	367	4	756	545	181	30
Avon	987	10	7	..	17	12	3	1	1	..	1	..	....	2	..	3	..	1	6	8	..	14	12	2	..
Berlin	2,346	40	27	..	67	31	34	....	2	..	12	...	1	....	..	13	1	..	18	9	..	27	26	1	..
Bloomfield	1,437	12	12	..	24	18	3	2	1	..	5	...	....	1	..	6	..	..	7	9	..	16	8	2	6
Bristol	3,788	56	49	2	107	66	26	4	10	1	38	2	....	5	..	45	1	4	33	31	..	64	54	10	..
Burlington	1,319	17	20	..	37	12	16	1	3	5	2	...	....	....	..	2	..	..	14	7	..	21	17	4	..
Canton	2,639	24	43	..	67	31	36	....	....	..	15	12	....	....	..	27	..	1	19	14	..	33	27	6	..
East Granby	853	10	6	..	16	15	1	....	....	..	4	...	....	....	..	4	1	..	7	9	..	16	13	3	..
East Hartford	3,007	56	32	..	88	47	28	5	5	3	17	3	4	4	..	28	1	5	28	27	..	55	45	7	3
East Windsor	2,882	26	24	..	50	18	27	2	3	..	16	...	....	4	..	20	..	..	15	14	..	29	24	5	..
Enfield	6,322	80	66	1	147	50	79	3	15	..	42	8	4	8	..	62	15	15	43	82	1	126	92	34	..
Farmington	2,616	20	20	..	40	22	12	3	3	..	10	...	1	....	..	11	..	..	20	26	..	46	36	7	3
Glastonbury	3,560	42	26	1	69	53	13	2	1	..	22	1	....	....	..	23	1	1	21	23	..	44	31	3	5
Granby	1,517	13	7	..	20	18	2	....	....	..	9	...	....	1	..	10	..	2	15	17	..	32	36	1	..
Hartland	789	4	5	1	10	8	2	....	....	..	2	...	....	....	..	2	..	..	3	3	..	6	7	...	..
Manchester	4,223	65	54	..	119	47	60	5	7	..	14	9	5	4	..	32	..	3	38	27	..	65	46	18	..
Marlborough	476	5	1	..	6	6	...	....	....	..	...	...	....	1	..	1	..	..	3	4	..	7	4	1	..
New Britain	9,480	215	182	5	402	183	177	14	28	..	48	21	7	17	4	97	1	6	97	96	2	195	116	38	53
Newington	778	4	12	1	16	7	8	1	....	..	4	1	....	....	..	5	..	..	8	9	1	18	16	2	..
Plainville	1,433	14	13	..	27	18	7	....	2	..	11	1	1	1	..	14	..	1	7	7	..	14	11	3	..
Rocky Hill	971	12	7	..	19	13	4	1	1	..	4	...	....	....	..	4	..	..	3	10	..	13	10	2	1
Simsbury	2,051	24	13	..	37	26	11	....	....	..	11	1	....	....	..	12	..	..	28	22	..	50	40	10	..
Southington	4,314	69	50	3	122	62	35	7	18	..	25	...	5	5	..	35	..	..	48	34	.	82	70	12	..
South Windsor	1,688	28	23	..	51	29	17	5	....	..	17	...	1	....	..	18	..	2	9	12	2	23	21	2	..
Suffield	3,277	30	29	..	59	31	25	2	1	..	17	...	2	2	1	22	2	5	20	12	..	32	23	9	..
West Hartford	1,533	6	7	.	13	10	2	....	1	..	8	1	....	....	..	9	1	..	8	17	..	25	21	3	1
Wethersfield	1,915	20	17	..	37	23	9	1	4	..	11	...	....	....	..	11	..	1	17	18	..	35	33	2	..
Windsor	2,783	27	27	..	54	25	21	2	6	..	8	2	....	1	..	11	..	1	10	6	..	26	23	3	..
Windsor Locks	2,154	25	23	..	48	24	15	1	8	..	12	10	1	3	..	26	3	1	13	17	..	30	18	12	..
Totals	109,007	1,450	1,192	14	2,656	1,247	1,066	115	184	44	608	148	55	100	8	919	40	80	950	940	10	1,900	1,425	379	96

NEW HAVEN COUNTY.

TOWNS.	Population in 1870.	BIRTHS.									MARRIAGES.								DEATHS.						
		Sex.				Parentage.													Sex.				Nativity.		
		Male.	Female.	Unknown.	Total.	American.	Foreign.	For. Husband, Am. Wife	Am. Husband, For. Wife.	Unknown.	Both American.	Both Foreign.	For. Wife, Amer. Husband.	Amer. Wife, For. Husband.	Unknown.	Total.	Both non-resident.	Hus. non-resident.	Male.	Female.	Unknown.	Total.	American.	Foreign.	Unknown.
New Haven	50,480	968	937	..	1,905	628	1,045	80	152	..	282	124	34	66	..	506	7	33	585	568	..	1,153	887	266	..
Beacon Falls*	....	7	5	..	12	3	6	2	1	..	1	1	....	....	..	2	1	..	.....	6	..	6	6	..	..
Bethany	1,135	7	5	..	12	11	1	....	....	..	2	...	....	....	..	2	..	..	4	1	..	5	5	...	..
Branford	2,488	32	28	..	60	33	17	1	6	..	14	1	2	5	..	22	..	1	22	27	..	49	44	3	2
Cheshire	2,344	27	18	..	45	27	16	1	1	..	10	...	2	1	..	13	..	1	15	20	..	35	29	6	..
Derby	8,020	159	123	3	285	88	145	17	31	..	46	17	3	5	..	71	46	..	78	100	..	178	146	27	5
East Haven	2,714	24	19	..	43	29	12	....	....	..	13	...	1	....	..	14	12	2	18	11	..	29	23	4	2
Guilford	2,476	26	23	..	49	38	8	2	1	..	13	...	1	....	..	14	..	..	18	20	..	38	37	...	1
Hamden	3,028	15	20	..	35	15	13	3	4	..	10	...	....	2	..	12	..	..	24	20	1	45	30	8	7
Madison	1,814	9	8	..	17	12	4	...	1	..	10	...	....	....	..	10	..	..	12	14	..	26	25	1	..
Meriden	10,495	254	206	..	460	176	217	24	39	4	66	32	7	22	..	127	1	7	189	178	..	367	280	87	..
Middlebury	696	3	3	..	6	5	1	....	....	..	6	...	....	....	..	6	..	..	6	6	..	12	11	1	..
Milford	3,405	28	21	..	49	42	5	....	2	..	15	2	1	....	..	18	1	1	31	38	..	69	60	5	4
Naugatuck	2,830	56	65	..	121	41	40	7	3	30	12	9	6	4	..	31	..	1	30	29	..	59	45	14	..
North Branford	1,035	5	7	..	12	11	1	....	....	..	5	...	....	1	..	6	..	..	6	4	..	10	9	1	..
North Haven	1,771	14	15	..	29	18	9	....	....	2	6	...	....	1	..	7	..	..	7	14	..	21	20	1	..
Orange	2,634	19	40	..	59	30	20	2	6	..	9	...	....	1	..	10	..	1	19	25	..	44	38	6	..
Oxford	1,338	9	13	..	22	19	3	....	....	..	5	...	....	....	..	5	1	..	10	8	..	18	16	2	..
Prospect	551	2	2	..	4	4	.....	....	....	..	2	...	....	....	..	2	..	..	5	2	..	7	6	1	..
Seymour	2,122	37	21	..	58	29	22	2	5	..	13	1	1	5	..	20	..	1	19	18	..	37	32	5	..
Southbury	1,318	14	12	..	26	20	4	1	1	..	10	...	....	....	..	10	..	1	12	5	..	17	17	...	..
Wallingford	3,676	68	51	2	121	53	48	4	11	5	18	6	1	6	..	31	..	1	46	38	1	85	68	16	1
Waterbury	13,106	224	226	..	450	140	276	20	23	..	92	34	14	28	..	168	..	1	121	113	..	234	152	82	..
Wolcott	491	2	2	1	5	4	1	....	....	..	...	...	....	....	..	......	..	..	3	2	..	5	5	...	..
Woodbridge	830	11	4	..	15	13	2	....	1	..	3	...	....	....	..	3	..	..	2	11	..	13	11	2	..
Totals	121,257	2,020	1,874	6	3,900	1,489	1,916	166	288	41	663	227	73	147	..	1,110	69	51	1,284	1,276	2	2,562	2,002	538	22

* Made a town in 1871, from Bethany, Naugatuck, Oxford, and Seymour.

NEW LONDON COUNTY.

TOWNS.	Population in 1870.	BIRTHS. Sex. Male.	BIRTHS. Sex. Female.	BIRTHS. Sex. Unknown.	BIRTHS. TOTAL.	BIRTHS. Parentage. American.	BIRTHS. Parentage. Foreign.	BIRTHS. Parentage. For. Husband, Am. Wife.	BIRTHS. Parentage. Am. Husband, For. Wife.	BIRTHS. Parentage. Unknown.	MARRIAGES. Both American.	MARRIAGES. Both Foreign.	MARRIAGES. For. Wife, Amer. Husband.	MARRIAGES. Amer. Wife, For. Husband.	MARRIAGES. Unknown.	MARRIAGES. TOTAL.	MARRIAGES. Both non-resident.	MARRIAGES. Hus. non-resident.	DEATHS. Sex. Male.	DEATHS. Sex. Female.	DEATHS. Sex. Unknown.	DEATHS. TOTAL.	DEATHS. Nativity. American.	DEATHS. Nativity. Foreign.	DEATHS. Nativity. Unknown.
NEW LONDON....	9,576	132	121	4	257	163	86	5	5	..	50	10	7	9	..	76	.	5	92	100	19	211	179	32	..
NORWICH........	16,653	247	222	3	472	177	280	15	....	..	94	31	13	23	..	161	1	3	265	230	2	497	389	108	..
Bozrah...........	984	8	4	..	12	2	9	1	....	..	5	...	1	1	..	7	..	1	2	4	..	6	4	2	..
Colchester........	3,383	21	29	..	50	21	22	2	5	..	17	6	4	6	..	33	..	1	34	30	..	64	48	7	9
East Lyme.......	1,506	21	21	1	43	31	11	....	1	..	9	...	....	......	..	9	2	..	15	16	..	31	19	...	12
Franklin..........	731	2	2	..	4	4	.....	....	....	..	4	...	...	.....	..	4	..	1	7	2	..	9	9	...	..
Griswold.........	2,575	22	27	7	56	28	23	4	1	..	15	10	3	1	..	29	..	5	18	11	..	29	25	4	..
Groton...........	5,124	33	50	2	85	75	9	....	1	..	39	1	4	.....	..	44	..	7	38	23	..	61	58	3	..
Lebanon..........	2,211	14	11	..	25	21	3	....	1	..	10	1	....	.....	..	11	..	..	8	13	..	21	21	..	..
Ledyard..........	1,392	13	11	..	24	.....	.....	....	....	24	4	...	....	.....	..	4	..	..	9	16	..	25	25	...	..
Lisbon............	502	11	6	..	17	7	9	1	....	..	1	...	...	...	..	1	..	..	6	8	..	14	12	2	..
Lyme............	1,181	11	13	..	24	23	.....	....	1	..	12	...	...	...	..	12	1	..	11	6	..	17	16	...	1
Montville.........	2,495	25	19	..	44	29	11	1	3	..	12	...	...	...	..	12	..	2	5	10	..	15	14	1	..
North Stonington.	1,759	25	13	..	38	30	4	3	1	..	3	...	...	...	..	3	..	..	26	22	..	48	47	1	..
Old Lyme........	1,362	15	19	1	35	28	6	1	....	..	10	...	...	...	..	10	..	1	8	5	..	13	13	...	..
Preston..........	2,161	14	10	..	24	21	2	...	1	..	4	1	1	1	..	7	..	1	19	21	..	40	....	....	40
Salem............	717	3	4	..	7	4	3	....	....	..	4	...	....	....	..	4	..	..	4	3	..	7	7	...	..
Sprague..........	3,463	56	40	..	96	6	90	....	....	..	5	21	4	.....	..	30	..	..	29	22	..	51	33	18	..
Stonington.......	6,313	74	59	..	133	71	51	5	6	..	21	8	2	7	..	38	5	1	42	47	..	89	57	15	17
Waterford........	2,482	27	18	3	48	38	9	....	1	.	18	...	....	1	..	19	..	2	9	13	..	22	22	...	..
Total..........	66,570	774	699	21	1,494	777	628	38	27	24	337	89	39	49	..	514	9	30	647	602	21	1.270	998	193	79

FAIRFIELD COUNTY.

TOWNS.	Population in 1870.	BIRTHS. Sex. Male.	Female.	Unknown.	TOTAL.	Parentage. American.	Foreign.	For. Husband, Am. Wife.	Am. Husband, For. Wife.	Unknown.	MARRIAGES. Both American.	Both Foreign.	For. Wife, Amer. Husband.	Amer. Wife, For. Husband.	Unknown.	TOTAL.	Both non-resident.	Hus. non-resident.	DEATHS. Sex. Male.	Female.	Unknown.	TOTAL.	Nativity. American.	Foreign.	Unknown.
DANBURY	8,753	128	88	2	218	121	81	4	9	3	54	8	4	4	7	77	1	5	72	57	2	131	76	10	45
Bridgeport	19,835	460	426	8	894	282	289	30	70	223	121	45	13	23	32	234	..	13	208	185	6	399	290	49	60
Bethel	2,311	30	19	..	49	36	9	1	3	...	9	...	...	...	..	9	1	1	16	23	..	39	33	5	1
Brookfield	1,193	15	6	..	21	12	8	1	...	...	1	...	...	...	..	1	..	..	7	7	..	14	14	...	...
Darien	1,808	13	21	1	35	27	7	...	1	...	9	...	...	...	..	9	..	2	14	11	..	25	25	...	...
Easton	1,288	10	6	..	16	12	4	...	...	...	3	...	...	...	..	3	..	..	4	8	..	12	12	...	...
Fairfield	5,645	28	23	..	51	27	15	4	5	...	19	4	...	...	4	27	1	1	13	28	..	41	37	4	...
Greenwich	7,644	50	39	..	89	56	23	5	5	...	17	...	5	4	..	26	4	3	42	34	..	76	67	9	...
Huntington	1,527	23	22	..	45	32	8	1	4	...	8	1	...	...	..	9	..	..	15	16	..	31	28	2	1
Monroe	1,226	5	1	..	6	6	...	...	...	...	13	...	...	...	..	13	..	..	3	3	..	6	6	...	...
New Canaan	2,497	23	16	1	40	27	8	...	5	...	11	...	...	1	..	12	..	2	17	18	..	35	32	2	1
New Fairfield	870	9	4	..	13	12	1	...	...	...	...	...	...	...	..	...	..	..	6	5	1	12	12	...	...
Newtown	3,681	35	18	..	53	24	27	2	...	...	14	8	1	3	..	26	..	..	21	18	..	39	32	7	...
Norwalk	12,119	155	134	1	290	186	172	11	19	2	43	5	9	7	..	64	1	10	121	95	1	217	183	28	6
Reading	1,624	10	15	..	25	17	8	...	...	...	4	...	...	...	..	4	..	..	8	9	..	17	16	1	...
Ridgefield	1,919	12	11	..	23	22	...	...	1	...	9	1	...	1	..	11	..	..	17	14	1	32	30	1	1
Sherman	846	10	10	..	20	19	1	...	...	...	3	...	...	...	..	3	..	..	9	5	..	14	13	1	...
Stamford	9,714	154	135	1	290	71	188	9	18	4	47	13	3	7	..	70	1	12	99	80	1	180	146	36	8
Stratford	3,032	9	8	..	18	13	4	1	...	...	24	1	1	1	..	27	1	4	10	13	..	23	22	1	...
Trumbull	1,335	11	8	.	19	17	2	...	...	...	5	...	...	2	..	7	..	..	8	12	..	20	20	...	...
Weston	1,054	7	7	..	14	10	4	...	...	...	8	...	...	...	..	8	..	1	4	7	..	11	10	1	...
Westport	3,361	27	31	3	61	41	13	3	4	...	19	2	2	...	..	23	..	2	30	20	1	51	45	6	...
Wilton	1,994	15	15	..	30	23	1	2	4	...	10	...	...	2	..	12	..	2	12	19	..	31	9	1	21
Totals	95,276	1,239	1,064	17	2,320	993	873	74	148	232	451	88	38	55	43	675	9	58	756	687	13	1,456	1,148	164	144

WINDHAM COUNTY.

TOWNS.	Population in 1870.	BIRTHS.									MARRIAGES.								DEATHS.						
		Sex.				Parentage.													Sex.				Nativity.		
		Male.	Female.	Unknown.	Total.	American.	Foreign.	For. Husband, Am. Wife.	Am. Husband, For. Wife.	Unknown.	Both American.	Both Foreign.	For. Wife, Amer. Husband.	Amer. Wife, For. Husband.	Unknown.	Total.	Both non-resident.	Hus. non-resident.	Male.	Female.	Unknown.	Total.	American.	Foreign.	Unknown.
Brooklyn	2,354	21	19	..	40	15	25	....	....	..	:	2	....	....	..	4	..	1	16	15	..	31	26	5	..
Ashford	1,241	2	6	..	8	8	....	....	....	..	4	...	....	1	..	5	.	..	10	5	..	15	12	1	2
Canterbury	1,543	7	12	..	19	15	2	1	1	..	9	...	....	....	..	9	..	1	8	10	..	18	17	1	..
Chaplin	704	4	7	..	11	10	....	....	1	..	3	...	....	....	..	3	..	..	3	3	..	6	6	....	..
Eastford	983	6	4	..	10	10	....	....	....	..	8	...	....	....	..	8	..	..	12	11	..	23	22	1	..
Hampton	891	5	10	..	15	13	2	....	....	..	..	...	....	....	..	....	..	..	6	9	..	15	14	1	..
Killingly	5,712	102	87	..	189	93	81	8	7	..	27	22	6	4	..	59	1	5	69	37	..	106	89	17	..
Plainfield	4,521	31	43	..	74	33	35	....	6	..	20	3	3	....	..	25	5	1	23	15	..	38	38	....	..
Pomfret	1,488	21	22	..	43	29	8	2	4	..	3	2	....	....	..	6	..	2	19	9	..	28	28	..	..
Putnam	4,192	100	112	4	216	53	145	18	....	..	43	25	3	4	..	75	2	17	55	63	3	121	83	38	..
Scotland	643	2	2	..	4	2	2	....	....	..	8	...	....	....	..	8	..	..	3	6	..	9	9	....	..
Sterling	1,022	11	10	..	21	10	9	....	2	..	4	1	....	....	..	5	2	..	4	3	..	7	7	....	..
Thompson	3,804	67	71	..	138	22	108	4	4	..	16	23	3	....	..	42	2	4	51	38	1	90	74	16	..
Voluntown	1,052	25	14	..	39	28	11	....	....	..	7	...	1	....	..	8	..	..	11	11	..	22	20	2	..
Windham	5,412	97	89	1	187	71	88	13	15	..	58	8	2	5	.	73	1	7	58	66	2	126	100	15	11
Woodstock	2,955	20	12	..	32	30	2	....	..	..	9	...		1	..	10	1	2	13	19	..	32	27	2	3
Totals	38,518	521	520	5	1,046	442	518	46	40	..	221	86	18	15	..	340	14	40	363	318	6	687	571	99	17

LITCHFIELD COUNTY.

TOWNS.	Population in 1870.	BIRTHS. Sex. Male.	Female.	Unknown.	TOTAL.	Parentage. American.	Foreign.	For. Husband, Am. Wife.	Am. Husband, For. Wife.	Unknown.	MARRIAGES. Both American.	Both Foreign.	For. Wife, Amer. Husband.	Amer. Wife, For. Husband.	Unknown.	TOTAL.	Both non-resident.	Hus. non-resident.	DEATHS. Sex. Male.	Female.	Unknown.	TOTAL.	Nativity. American.	Foreign.	Unknown.
LITCHFIELD	3,111	36	18	..	55	34	15	....	1	..	21	4	....	....	..	25	..	1	16	23	..	39	30	3	6
Barkhamsted	1,439	6	9	..	15	11	4	....	....	..	10	...	....	....	..	10	2	..	7	6	..	13	12	1	..
Bethlehem	750	7	6	..	13	9	1	1	2	..	7	...	....	....	..	7	..	1	5	1	..	6	6	...	..
Bridgewater	877	5	6	..	11	11	....	....	....	..	1	...	....	....	..	1	..	..	3	3	..	6	6	...	..
Canaan	1,257	10	8	..	18	15	3	....	....	..	4	...	....	....	..	4	..	..	4	5	..	9	8	1	..
Colebrook	1,141	3	3	..	6	6	....	....	....	..	5	...	1	1	..	7	1	3	4	5	..	9	5	1	3
Cornwall	1,772	15	8	..	23	15	8	....	....	..	10	...	....	1	..	11	..	1	8	8	..	16	16	...	..
Goshen	1,223	7	4	1	12	10	2	....	....	..	7	...	....	....	..	7	..	1	6	4	1	11	11	...	..
Harwinton	1,044	9	8	..	17	14	1	....	2	..	10	...	....	....	..	.....	..	..	6	9	..	15	14	1	..
Kent	1,744	9	13	..	22	20	2	....	....	..	9	...	....	1	..	10	..	1	7	6	..	13	12	1	..
Morris	701	5	2	..	7	7	....	....	....	..	1	...	....	....	..	1	..	..	7	6	..	13	13	...	..
New Hartford	3,078	45	34	1	80	37	39	....	4	..	10	2	2	....	1	15	2	2	29	21	..	50	32	14	4
New Milford	3,586	35	29	.	64	44	17	2	1	..	33	1	....	....	1	34	..	1	19	22	..	41	25	1	15
Norfolk	1,641	8	12	..	20	12	8	....	....	..	8	...	....	....	..	8	1	3	6	13	1	20	16	3	1
North Canaan	1,695	25	20	..	45	24	20	....	1	..	5	...	....	....	..	5	..	..	13	9	..	22	22	...	..
Plymouth	4,149	15	20	..	35	23	11	1	....	..	8	...	....	2	..	10	..	..	8	8	..	16	12	4	..
Roxbury	919	6	9	..	15	13	1	1	....	..	5	...	....	1	..	6	..	..	5	8	..	13	10	3	..
Salisbury	3,303	50	39	..	89	52	37	....	....	..	13	2	1	1	..	17	2	4	19	15	1	35	30	5	..
Sharon	2,441	14	23	..	37	29	5	....	3	..	9	...	....	....	..	9	..	2	16	10	..	26	19	3	4
Thomaston	....	38	37	1	76	28	35	4	9	..	11	4	3	2	..	19	..	..	16	14	..	30	27	2	1
Torrington	2,893	30	29	..	59	25	28	3	3	.	13	...	2	2	..	17	1	1	30	22	..	52	38	14	..
Warren	673	10	4	..	14	11	3	....	....	..	7	...	....	....	..	7	..	1	5	2	..	7	7	...	..
Washington	1,563	12	21	..	33	17	11	1	3	..	8	...	....	....	..	8	..	..	8	9	..	17	15	2	..
Watertown	1,698	20	10	..	30	22	8	1	1	..	10	...	....	2	..	14	1	3	5	13	..	18	17	1	..
Winchester	4,096	79	61	1	141	66	59	7	9	..	37	2	4	3	..	46	..	5	40	38	1	79	69	10	..
Woodbury	1,931	21	23	..	44	20	22	1	1	..	9	...	....	3	..	12	..	..	10	16	3	29	22	7	..
Totals	48,727	520	456	4	981	577	338	22	40	..	272	15	13	19	2	321	10	30	302	296	7	605	496	75	34

MIDDLESEX COUNTY.

TOWNS.	Population in 1870.	BIRTHS.									MARRIAGES.								DEATHS.						
		SEX.				PARENTAGE.													SEX.				NATIVITY.		
		Male.	Female.	Unknown.	TOTAL.	American.	Foreign.	For. Husband, Am. Wife.	Am. Husband, For. Wife.	Unknown.	Both American.	Both Foreign.	For. Wife, Amer. Husband.	Amer. Wife, For. Husband.	Unknown.	TOTAL.	Both non-resident.	Hus. non-resident.	Male.	Female.	Unknown.	TOTAL.	American.	Foreign.	Unknown.
MIDDLETOWN....	11,126	104	103	1	208	116	68	13	21	..	72	27	6	6	..	111	..	7	91	115	..	206	156	45	5
HADDAM.........	2,071	24	12	..	36	26	4	....	6	..	10	3	....	1	..	14	..	1	12	14	..	26	26	...	..
Chatham.........	2,771	23	22	..	45	32	12	....	1	..	7	...	....	....	..	7	..	..	13	15	..	28	28	...	..
Chester..........	1,094	14	10	..	24	.....	.....	....	....	24	3	3	....	1	..	7	..	..	13	8	..	21	17	4	..
Clinton..........	1,404	6	16	..	22	21	1	....	....	..	10	...	....	....	..	10	..	..	10	14	..	24	21	...	3
Cromwell.........	1,856	14	18	1	33	9	18	2	4	..	1	...	2	1	..	4	..	.	13	17	..	30	21	9	..
Durham..........	1,086	9	6	..	15	10	3	2	....	..	5	...	....	....	..	5	..	..	8	7	..	15	10	5	..
East Haddam.....	2,951	27	20	..	47	42	5	....	....	..	22	...	1	2	..	25	1	3	28	18	..	46	44	2	..
Essex............	1,669	11	15	..	26	22	4	....	....	..	14	...	....	....	..	14	..	..	10	5	..	15	15	...	..
Killingworth.....	856	1	5	..	6	5	1	....	....	..	5	...	....	....	..	5	..	..	4	5	..	9	9	...	..
Middlefield.......	1,053	3	8	..	11	5	4	1	1	..	2	...	....	....	..	2	..	..	2	7	..	9	8	1	..
Old Saybrook.....	1,215	14	11	..	25	16	8	1	....	..	8	1	....	....	..	9	..	2	7	11	..	18	17	1	..
Portland.........	4,693	51	40	..	91	30	58	2	1	..	6	15	4	2	..	27	.	3	27	39	..	66	46	20	..
Saybrook........	1,267	10	12	..	22	16	3	2	1	..	4	...	....	....	..	4	..	..	12	8	..	20	20	...	..
Westbrook.......	987	5	7	..	12	12	.....	....	....	..	7	...	....	1	..	8	..	1	9	13	..	22	22	...	..
Totals.........	36,099	316	305	2	623	362	189	23	35	24	176	49	13	14	..	252	1	17	259	296	..	555	460	87	8

TOLLAND COUNTY.

TOWNS.	Population in 1870.	BIRTHS.									MARRIAGES.								DEATHS.						
		Sex.				Parentage.													Sex.				Nativity.		
		Male.	Female.	Unknown.	Total.	American.	Foreign.	For. Husband, Am. Wife.	Am. Husband, For. Wife.	Unknown.	Both American.	Both Foreign.	For. Wife, Amer. Husband.	Amer. Wife, For. Husband.	Unknown.	Total.	Both non-resident.	Hus. non-resident.	Male.	Female.	Unknown.	Total.	American.	Foreign.	Unknown.
Tolland	1,216	13	10	..	23	18	5	....	....	..	10	1	....	....	..	11	1	1	14	9	..	23	17	3	3
Andover	461	4	2	..	6	5	1	....	....	..	2	...	....	....	..	2	..	..	3	4	..	7	6	1	..
Bolton	576	5	5	..	10	7	3	....	....	..	6	...	....	2	..	8	..	1	6	4	..	10	9	1	..
Columbia	891	5	6	..	11	8	3	....	....	..	8	...	....	....	..	8	..	1	11	6	..	17	14	3	..
Coventry	2,057	24	16	..	40	25	12	1	2	..	15	4	....	....	2	21	..	2	13	12	..	25	16	7	2
Ellington	1,452	5	12	..	17	11	5	....	1	..	8	...	....	1	..	9	1	2	4	9	..	13	10	3	..
Hebron	1,279	9	9	..	18	12	2	1	3	..	6	...	....	....	..	6	..	..	6	6	..	12	12	....	..
Mansfield	2,401	18	19	1	38	31	6	....	....	1	15	...	1	....	..	16	..	..	12	9	1	22	20	2	..
Somers	1,247	9	11	1	21	16	5	....	....	..	7	...	....	....	..	7	..	1	8	6	..	14	14	....	..
Stafford	3,405	38	37	..	75	39	26	2	8	..	22	1	1	3	9	36	3	7	22	19	1	42	30	8	4
Union	627	3	8	..	11	8	2	1	....	..	5	...	....	....	..	5	..	3	2	4	..	6	6	....	..
Vernon	5,446	88	96	..	184	57	106	7	14	..	21	13	5	13	1	53	3	2	57	48	..	105	79	26	..
Willington	942	11	14	..	25	16	5	2	2	..	2	...	....	....	..	2	..	..	12	9	..	21	19	2	..
Totals	22,000	232	245	2	479	253	181	14	30	1	127	19	7	19	12	184	8	20	170	145	2	317	252	56	9

RECAPITULATION BY COUNTIES.

COUNTIES.	Population in 1870.	BIRTHS.									MARRIAGES.								DEATHS.						
		Sex.				Parentage.													Sex.				Nativity.		
		Male.	Female.	Unknown.	Total.	American.	Foreign.	For. Husband, Am. Wife.	Am. Husband, For. Wife.	Unknown.	Both American.	Both Foreign.	For. Wife, Amer. Husband.	Amer. Wife, For. Husband.	Unknown.	Total.	Both non-resident.	Hus. non-resident.	Male.	Female.	Unknown.	Total.	American.	Foreign.	Unknown.
Hartford.....	109,007	1,450	1,192	14	2,656	1,247	1,066	115	184	44	608	148	55	100	8	919	40	80	950	940	10	1,900	1,425	379	96
New Haven...	121,257	2,020	1,874	6	3,900	1,489	1,916	166	288	41	663	227	73	147	..	1,110	69	51	1,284	1,276	2	2,562	2,002	538	22
New London.	66,570	774	699	21	1,494	777	628	38	27	24	337	89	39	49	..	514	9	30	647	602	21	1,270	1,000	191	79
Fairfield......	95,276	1,239	1,064	17	2,320	993	873	74	148	232	451	88	38	55	43	675	9	58	756	687	13	1,456	1,148	164	144
Windham....	38,518	521	520	5	1,046	443	518	46	39	...	221	86	18	15	..	340	14	40	363	318	6	687	571	99	17
Litchfield.....	48,727	521	456	4	981	586	333	22	40	...	272	15	13	19	2	321	10	30	302	296	7	605	496	75	34
Middlesex.....	36,099	316	305	2	623	362	189	23	35	24	176	49	13	14	..	252	1	17	259	296	..	555	460	87	8
Tolland......	22,000	232	245	2	479	253	181	14	30	1	127	19	7	19	12	184	8	20	170	145	2	317	252	56	9
Totals.....	537,454	7,073	6,355	71	13,499	6,150	5,704	498	791	356	2,855	721	256	418	65	4,315	160	326	4,731	4,560	61	9,352	7,354	1,589	409

TABLE

EXHIBITING THE NUMBER OF BIRTHS IN THE SEVERAL COUNTIES FOR EACH MONTH OF THE YEAR ENDING DECEMBER 31, 1878.

COUNTY.	SEX.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	TOTAL.
Hartford....	Males......	131	115	144	102	123	115	123	137	127	121	103	109	1,450
	Females...	110	84	99	79	102	107	108	104	111	95	94	99	1,192
	Not stated.	1	....	....	1	2	....	1	....	3	....	4	2	14
New Haven..	Males.....	165	168	165	171	165	160	169	173	167	176	173	168	2,020
	Females...	159	137	154	139	163	146	171	166	159	165	160	155	1,874
	Not stated.	....	1	....	....	1	....	....	....	....	1	....	3	6
New London.	Males.....	68	65	68	58	68	62	64	61	76	64	64	59	777
	Females...	67	67	45	46	50	71	66	53	62	53	55	64	699
	Not stated.	4	3	....	....	1	....	5	1	1	....	....	3	18
Fairfield.....	Males.....	120	81	114	103	91	86	103	108	120	97	99	117	1,239
	Females...	103	72	91	89	106	67	79	97	103	92	86	79	1,064
	Not stated.	....	....	2	5	1	1	2	2	2	....	2	....	17
Windham....	Males.....	53	37	48	51	40	36	48	46	47	37	34	44	521
	Females...	38	44	41	36	36	37	51	57	36	44	51	49	520
	Not stated.	....	....	....	....	1	....	4	....	....	....	....	....	5
Litchfield....	Males.....	41	41	45	55	52	38	39	56	36	52	40	26	521
	Females...	56	25	43	31	39	35	44	49	38	29	30	37	456
	Not stated.	1	....	....	....	....	1	....	1	....	....	....	1	4
Middlesex...	Males.....	38	22	22	24	22	22	24	30	28	22	34	28	316
	Females...	19	23	21	35	24	26	33	32	22	23	10	37	305
	Not stated.	....	....	1	....	....	....	....	....	....	....	....	1	2
Tolland.....	Males.....	20	13	22	25	13	22	19	16	24	21	19	18	232
	Females...	21	27	13	26	25	20	5	31	15	23	20	19	245
	Not stated.	....	....	....	....	....	1	....	....	....	....	....	1	2
Total....	Males.....	636	542	628	589	574	541	589	627	625	590	566	569	7,076
	Females...	573	479	507	481	545	509	557	589	546	524	506	539	6,355
	Not stated.	6	4	3	6	6	3	12	4	6	1	6	11	68
Grand Total...........		1215	1025	1138	1076	1125	1053	1158	1220	1177	1115	1078	1119	13,499

TABLE 2.

CAUSES OF DEATHS ARRANGED BY TOWNS AND COUNTIES.

CLASS I.—ZYMOTIC DISEASES.

Towns in Hartford Co.	Order 1.—Miasmatic.																							Order 2.—Enthetic.					Order 3.—Dietic.						Total for Class 1.		
	Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Eclampsia.	Carbuncle.	Pyaemia.	Septicaemia.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Congestive Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Privation.	Purpura.	Alcoholism.	Intemperance.	Total. M.	Total. F.	Males.	Females.	Total.
Hartford	1	9	9	8	21	22	2	2		2			8	6	49	2		3		8	2	74	80	2	1		2	1	1			3	3	1	79	82	161
Avon			1			1									1							3							1				1		4		4
Berlin					2													1				1	2		2		2			1				1	3	3	6
Bloomfield																																					
Bristol			5			4	1								1	1						9	3									1	1		10	3	13
Burlington						2																2			1			1							2	1	3
Canton		2	2	2											3					1		5	5												5	5	10
East Granby			4					1														2	3												2	3	5
East Hartford			1			4							1		4			4		1		8	7												8	7	15
East Windsor			1			1								1	4							3	4												3	4	7
Enfield		1	4	4	1		3	1						4	9			2			1	15	15			1	1								16	15	31
Farmington						2									3							3	2												3	2	5
Glastonbury															1	1						2													2		2
Granby			10												1							4	7												4	7	11
Hartland			2																			1	1												1	1	2
Manchester				2	1		1	1						3	7							10	5	1			1								11	5	16
Marlborough																					1	1													1		1
New Britain		23	10	1	1	2							5	1	9	2		1				29	26												29	26	55
Newington			2												3			1				3	3												3	3	6
Plainville		1			2															1		1	3												1	3	4
Rocky Hill		1						1						1		1							4													4	4
Simsbury	1		5		1	1									2	1					1	5	7												5	7	12
Southington			7	8	5			1							4							16	9												16	9	25
South Windsor			2				4							1								3	4												3	4	7
Suffield					1									1						1		3				1	1								4		4
West Hartford		2						1								1					1	1	4												1	4	5
Wethersfield		2													1	3		1				5	2												5	2	7
Windsor			1		3										1					1		3	3												3	3	6
Windsor Locks					2										1	1				1		1	4												1	4	5
Totals	2	41	66	25	40	39	11	8		2			14	18	104	13		13		14	6	213	203	3	4	2	7	2	2	1		4	5	2	225	207	432

Towns in Hartford Co.	CLASS II.—CONSTITUTIONAL DISEASES. Order 1.—Diathetic. Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Marasmus.	Phthisis.	Hydrocephalus.	Peritonitis.	Meningitis.	Total. M.	Total. F.	Total for Class II. Males.	Females.	Total.
HARTFORD	4	23		10	7	4		130				67	67	77	84	161
Avon		1			1			2					2		3	3
Berlin		1	1	2				5	2			7		9		9
Bloomfield								3					3		3	3
Bristol		4			4			16				6	10	6	14	20
Burlington								4				4		4		4
Canton								4				2	2	2	2	4
East Granby								4					4		4	4
East Hartford	1	2		1	2			6				5	1	6	3	9
East Windsor								1	1			2		2		2
Enfield		2		1	1			23				5	18	6	19	25
Farmington		1			1		1	4				3	2	3	3	6
Glastonbury	1	6		5	2			6				3	3	8	5	13
Granby								2				1	1	1	1	2
Hartland	2			2				1					1	2	1	3
Manchester	1			1		2		10				5	7	6	7	13
Marlborough								2					2		2	2
New Britain	2	4	2	5	3		1	20	1			11	11	16	14	30
Newington								1					1		1	1
Plainville						1		2				1	2	1	2	3
Rocky Hill		1			1										1	1
Simsbury	1	1		1	1			3	1			3	1	4	2	6
Southington	1	1		1	1		1	15				10	6	11	7	18
South Windsor							1	2				2	1	2	1	3
Suffield	2			1	1		2	2	2			3	3	4	4	8
West Hartford		1			1			5				2	3	2	4	6
Wethersfield			1	1				7				4	3	5	3	8
Windsor		2			2		1	3				1	3	1	5	6
Windsor Locks	2	1		2	1		1	6				3	4	5	5	10
Totals	17	51	4	33	39	7	8	289	7			150	161	183	200	383

Towns in Hartford Co.	CLASS III.—LOCAL DISEASES. Order 1.—Nervous System. Apoplexy.	Paralysis.	Insanity.	Chorea.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total. M.	Total. F.	Order 2.—Organs of Circulation. Pericarditis.	Aneurism.	Heart Disease.	Angina.	Total. M.	Total. F.	Order 3.—Respiratory System. Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
HARTFORD	11	8	4	1	3	1	9	13	38		48	40	1		33		17	17		1		58		7	36	30
Avon	1											1			1			1		1		1			1	1
Berlin	1	3				1					3	2			1		1					1			1	1
Bloomfield	5										3	2										2			1	1
Bristol	2	2	1					4			5	4			6		4	2						1		1
Burlington		3									2	1				1	1							1		1
Canton	2								1		2	1								1		2		2	4	1
East Granby							1				1				1		1									
East Hartford	3	3					3	1			3	7			1			1						3	1	2
East Windsor		1						1			1	1														
Enfield		1							3		3	1			2		2			1		1			2	
Farmington	3		1				2		2		4	4			1			1		1		2			1	2
Glastonbury	7		1						1		3	6			4		2	2		1		1			1	1
Granby	1						1				1	1									1	4			2	3
Hartland	1											1														
Manchester	3	4									5	2			2		1	1				7			5	3
Marlborough		1										1														
New Britain	3	1					5		3		6	6			2			2		1	1	9			5	6
Newington		1									1											2			1	1
Plainville	3										2	1								1		2			2	1
Rocky Hill		2			1							3			1		1					1				1
Simsbury	5	1	1						1		5	3			2		1	1				2			1	1
Southington	1	1	1				4				2	5			6		5	1				9			6	3
South Windsor			1				1				1	1			1			1				2				2
Suffield	3	3					2		2		5	5			2		1	1				1			1	
West Hartford															1			1				2			1	1
Wethersfield	1						1	1			2	1			1			1		1		1		2	2	2
Windsor		2						1			3											1		2	1	2
Windsor Locks	1					1		1	2		3	2			2			2				3		1	2	2
Totals	57	37	10	1	4	3	29	22	53		114	102	1		70	1	37	35		9	2	114		20	76	69

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Hartford Co.	Order 4.—Digestive Organs.															Order 5.—Urinary Organs.										Order 6.—Generative Organs.				Order 7.—Organs of Locomotion.					Order 8.—Integumentary System.						Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Intussusception.	Fistula.	Strict. Œsoph.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Nephritis.	Bright's Disease.	Diabetes.	Gravel.	Cystitis.	Kidney Disease.	Uræmia.	Prostatitis.	Total. M.	Total. F.	Ovarian Dropsy.	Ovarian tumor.	Disease of Uterus.	Total.	Joint Diseases.	Caries.	Necrosis.	Total. M.	Total. F.	Phlegmon.	Ulcer.	Tumor.	Skin Diseases.	Total. M.	Total. F.	Males.	Females.	Total.
Hartford		1	2	2	2				11			5		11	12		13	2			5			14	6												5		4	1	130	106	236
Avon																					1				1																1	4	5
Berlin																																					1			1	4	4	8
Bloomfield	2											1			1																										4	4	8
Bristol							2					2		1	3			1			1			2		1			1												12	11	23
Burlington															2		1							1						1			1								5	4	9
Canton																														1			1								7	2	9
East Granby																				1				1																	3	...	3
East Hartford																	1								1																4	11	15
East Windsor												1			1						1				1																1	3	4
Enfield									3					1	2		2							1	1																9	4	13
Farmington			1												1		3	1						2	2		1		1												7	11	18
Glastonbury																																									6	9	15
Granby			1												1		2			2	1			5																	8	5	13
Hartland																																									...	1	1
Manchester	1				1								1	1	2				1		2			3																	15	8	23
Marlborough																																									...	1	1
New Britain			1									3		1	3		1			1	2			3	1	2			2												15	20	35
Newington			1												1		1							1																	3	2	5
Plainville																																									4	2	6
Rocky Hill																		1			1			1	1																2	5	7
Simsbury												1		1			1								1																8	6	14
Southington	1		1		1								1	2	2			1			1			1	1																16	12	28
South Windsor																																									1	4	5
Suffield		1												1																											8	6	14
West Hartford																		1		1				2													1			1	4	2	6
Wethersfield												1		1																					1					1	5	5	10
Windsor																		1						1																	5	2	7
Windsor Locks																																				1			1		5	7	12
Totals	4	2	7	2	4	..	2	..	14	..	..	14	2	20	31	..	25	8	1	5	15	..	..	38	16	3	1	..	4	2	..	..	2	..	1	1	7	..	5	4	292	261	553

4

Towns in Hartford Co.	Class IV.—Developmental Diseases. Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Spina Bifida.	Malformation.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Metritis.	Childbirth.	Total.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4.—Of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
Hartford	16	11					16	11		11	11	13	25	11	14	40	61	101
Avon																		
Berlin	2						1	1				1				2	1	3
Bloomfield												1	1			1	1	2
Bristol														2	3	2	3	5
Burlington												3	2			3	2	5
Canton	3						2	1				2	2			4	3	7
East Granby		1										1	2			2	2	4
East Hartford							1					2	1	1	1	3	2	5
East Windsor	2	2					2	2		2	2	5	2			7	6	13
Enfield	3				1		3	1		5	5	6	1			9	7	16
Farmington										2	2	1	2	2		3	4	7
Glastonbury										1	1	2	6			2	7	0
Granby													2				2	2
Hartland																		
Manchester			1		1		2			1	1		1			2	2	4
Marlborough																		
New Britain	2	4	1				5	2				1	4			9	6	12
Newington	1						1					1	2			2	2	4
Plainville																		
Rocky Hill																		
Simsbury												2				2		2
Southington		3					1	2				1	3		1	2	6	8
South Windsor		2					2						3			2	3	5
Suffield	1						1					1	1			2	1	3
West Hartford												1				1		1
Wethersfield	1							1					3		1		5	5
Windsor					1			1					1				3	3
Windsor Locks		1						1		1	1						1	1
Totals	31	24	2		3		37	23		23	23	44	64	16	20	97	103	227

Towns in Hartford Co.	Class V.—Violent Deaths. Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Accidents.	Railway Injury.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 2, 3, 4. Order 3—Homicide. M.	Homicide. F.	Order 4—Suicide. M.	Suicide. F.	Sudden. M.	Sudden. F.	Sudden Cause, unascertained. M.	Unascertained. F.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.
Hartford		3	1		8			1	13	22	4			1	2			40	28	63	34	97	389	367	756
Avon						2				1	1									1	1	2	6	8	14
Berlin			1							1										1		1	19	8	27
Bloomfield							1			1								1	1	2	1	3	7	9	16
Bristol					1					1				1		1				3		3	33	31	64
Burlington																							14	7	21
Canton		2								2									1	2	1	3	20	13	33
East Granby																							7	9	16
East Hartford			1			1				1	1			1				5	3	7	4	11	28	27	55
East Windsor						1			1	1	1								1	1	2	3	14	15	29
Enfield			1			2				1	2							6	32	7	34	41	47	79	126
Farmington					1	1				1	1	1				1	1	2	3	5	5	10	21	25	46
Glastonbury									1	1								2	2	3	2	5	21	23	44
Granby																		2	2	2	2	4	15	17	32
Hartland																							3	3	6
Manchester					1	1					2				1	2		2	2	4	5	9	38	27	65
Marlborough																	1	1	1	1	2	3	2	5	7
New Britain	1	1			1				1	3	1							31	28	34	29	63	100	95	195
Newington						1				2										2		2	10	8	18
Plainville					1					1										1		1	7	7	14
Rocky Hill								1			1										1	1	2	11	13
Simsbury			1				12	1		7	7							1	1	8	8	16	27	23	50
Southington																1			2	1	2	3	46	36	82
South Windsor						2					2			1						1	2	3	9	14	23
Suffield						2			1	1	2									1	2	3	19	13	32
West Hartford																		2	5	2	5	7	10	15	25
Wethersfield	2									1	1				1			1	1	3	3	5	17	18	35
Windsor		1			1					1	1							1	1	2	2	4	11	15	26
Windsor Locks			1			1				1	1									1	1	2	12	18	30
Totals	4	7	6		14	14	13	3	17	50	28	1		4	4	5	2	102	114	157	148	305	954	946	1,900

CLASS I.—ZYMOTIC DISEASES.

Towns in New Haven Co.	Order 1.—Miasmatic. Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Eclampsia.	Carbuncle.	Pyaemia.	Septicaemia.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Congestive Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Order 2.—Enthetic. Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Order 3.—Dietic. Privation.	Purpura.	Alcoholism.	Intemperance.	Total. M.	Total. F.	Total for Class I. Males.	Females.	Total.
New Haven	1	29	55	42	3	13	8	4	1	1			3	3	53	3		6	2	2	3	110	122	2			1	1	1	1		1		3	111	126	237
Beacon Falls				1																			1													1	1
Bethany																						1													1		1
Branford		3				1	1	1							1			4	1			5	7												5	7	12
Cheshire		3					1											1				3	2									1	1		4	2	6
Derby		49	1	2		1						1	2	1	7		1	9		1	4	38	41						1					1	38	42	80
East Haven			1			1																3	1												3	1	4
Guilford		1				3										1						3	2												3	2	5
Hamden			2			1									1			12	1			9	8												9	8	17
Madison	1		1			1																3													3		3
Meriden		28	23	21	8	8	3	2	1				4	2	25	3		2	1			68	62			1	1					1	1		70	62	132
Middlebury			1				2															1	2												1	2	3
Milford			12	2												1		1			3	10	9												10	9	19
Naugatuck		5		1		4									7							10	7												10	7	17
North Branford																1						1													1		1
North Haven														1		1		3	1		1	3	4												3	4	7
Orange					1									1	6			3				4	7												4	7	11
Oxford		3																2		1		3	3												3	3	6
Prospect																																					
Seymour		1	1			4		1						1	3							6	5												6	5	11
Southbury			1											1					1			3			1		1								4		4
Wallingford		5	1	1	1	1								1	2	1		4		1		11	7									1	1		12	7	19
Waterbury	1	6	3			14	4	1					2		14			3				27	21									1	1		28	21	49
Wolcott			1																				1													1	1
Woodbridge						1	2								1								4													4	4
Totals	3	133	103	70	70	55	21	8	2	1	..	1	11	11	120	11	1	50	7	5	11	322	316	2	1	1	3	1	2	1	..	5	4	4	329	321	650

CLASS II.—CONSTITUTIONAL DISEASES.

Towns in New Haven Co.	Order 1.—Diathetic.					Order 2.—Tubercular.								Total for Class II.		
	Dropsy, Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Scrofula.	Marasmus.	Phthisis.	Hydrocephalus.	Peritonitis.	Meningitis.	Total. M.	Total. F.	Males.	Females.	Total.
New Haven	7	26	..	9	24	3	29	166	4	..	..	88	114	97	138	235
Beacon Falls	..	..	..	..	..	..	..	..	..	..	..	...	3	...	3	3
Bethany	1	..	..	1	..	..	..	..	..	..	..	...	...	1	...	1
Branford	1	..	..	..	1	1	..	6	..	..	..	4	3	4	4	8
Cheshire	1	..	..	..	1	..	..	4	..	..	..	...	4	...	5	5
Derby	2	6	..	2	6	1	4	17	2	1	..	14	11	16	17	33
East Haven	..	..	..	..	..	..	..	1	..	..	..	1	...	1	...	1
Guilford	1	..	..	1	..	..	..	6	..	..	1	1	6	2	6	8
Hamden	2	1	..	1	2	1	1	3	..	..	..	3	2	4	4	8
Madison	1	..	..	..	1	1	..	6	1	..	..	3	5	3	6	9
Meriden	10	4	..	6	8	1	6	38	4	..	..	23	26	29	34	63
Middlebury	1	1	..	1	1	..	..	1	..	..	..	1	...	2	1	3
Milford	2	3	..	1	4	..	..	15	..	..	..	7	8	8	12	20
Naugatuck	1	2	..	2	1	..	..	7	..	..	..	2	5	4	6	10
North Branford	..	1	..	.	1	..	..	1	..	..	..	...	1	...	2	2
North Haven	..	1	2	2	1	..	3	1	..	..	..	...	4	3	4	7
Orange	4	2	..	1	5	..	..	2	..	..	..	1	1	2	6	8
Oxford	..	1	..	..	1	..	..	..	..	..	..	...	...	...	1	1
Prospect	..	..	..	..	..	..	..	3	..	..	..	1	2	1	2	3
Seymour	2	3	..	..	5	..	1	6	..	..	..	5	2	5	7	12
Southbury	..	2	..	1	1	..	..	..	..	..	..	...	...	1	1	2
Wallingford	2	4	1	3	4	..	..	6	..	..	..	1	5	4	9	13
Waterbury	5	7	..	5	7	..	..	37	1	..	..	21	17	26	24	50
Wolcott	..	..	..	..	..	..	..	..	..	..	..	...	...	...	...	...
Woodbridge	..	..	..	..	..	..	..	1	..	..	..	...	1	...	1	1
Totals	43	64	3	36	74	8	44	327	12	1	1	176	220	213	293	506

CLASS III.—LOCAL DISEASES.

Towns in New Haven Co.	Order 1.—Nervous System.											Order 2.—Organs of Circulation.						Order 3.—Respiratory System.							
	Apoplexy.	Paralysis.	Insanity.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total. M.	Total. F.	Pericarditis.	Aneurism.	Heart Disease.	Angina.	Total. M.	Total. F.	Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
New Haven	32	29	3	2	3	61	44	24	..	107	91	1	..	63	..	46	18	4	25	..	61	..	12	55	47
Beacon Falls	..	..	..	..	..	...	..	..	..	...	...	..	..	...	..	...	...	..	..	..	...	..	..	..	..
Bethany	..	..	..	..	..	...	..	..	..	...	...	..	..	...	..	...	...	..	..	..	...	..	..	..	..
Branford	.	1	..	..	..	1	3	4	..	3	6	..	..	...	..	...	...	1	..	..	3	..	3	4	3
Cheshire	1	2	..	..	..	...	..	1	..	2	2	..	..	2	..	...	2		1	..	1	..	..	1	1
Derby	3	2	..	1	1	11	1	1	..	9	11	..	..	6	..	...	6	2	..	1	4	..	..	3	4
East Haven	2	2	..	1	..	1	..	1	..	4	3	..	..	3	..	3	...	.	..	..	1	..	1	1	1
Guilford	3	4	..	..	..	1	..	2	..	5	5	..	..	...	..	...	...	.	..	..	...	..	2	1	1
Hamden	2	..	..	..	..	3	..	2	..	5	2	..	..	2	..	1	1	.	..	..	2	..	2	2	2
Madison	..	2	..	..	..	1	..	..	..	1	2	..	..	...	..	...	...	..	..	..	...	..	..	..	..
Meriden	5	7	..	..	1	12	13	9	..	25	22	..	1	4	..	2	3	1	4	..	12	..	5	8	14
Middlebury	..	..	..	..	..	...	..	..	..	...	...	..	..	1	..	1	...	..	..	..	1	..	..	..	1
Milford	..	..	..	..	..	...	..	1	..	...	1	1	2	5	..	3	5	..	..	..	1	..	2	1	2
Naugatuck	1	..	..	..	..	4	..	3	..	6	2	..	..	1	..	...	1	..	..	1	...	..	..	..	1
North Branford	..	..	..	..	..	...	..	..	..	...	...	..	..	2	..	2	...	..	..	..	...	..	..	..	..
North Haven	1	1	..	..	..	...	..	..	..	1	1	..	..	...	..	...	...	..	..		4	..	2	..	3
Orange	..	3	..	..	..	...	..	..	..	1	2	..	..	4	..	1	3	..	1	..	1	..	2	5	2
Oxford	3	..	..	..	..	...	..	..	..	2	1	..	..	...	..	...	...	..	..	..	...	..	..	..	..
Prospect	..	..	..	..	..	2	..	..	..	2	...	..	..	...	..	...	...	..	..	..	...	..	..	..	..
Seymour	2	..	..	..	..	...	..	2	..	3	1	..	..	...	..	...	...	..	..	..	1	..	..	1	..
Southbury	1	..	..	..	..	1	..	1	..	3	...	..	..	...	..	...	...	..	..	..	1	..	..	..	1
Wallingford	1	3	..	..	..	1	..	..	..	4	1	..	..	1	..	1	...	..	..	..	5	..	..	3	1
Waterbury	8	7	..	..	..	16	12	9	..	30	22	..	..	13	..	8	5	..	1	.	11	..	1	4	9
Wolcott	..	..	..	..	..	...	..	1	..	1	...	..	..	...	..	...	...	..	..	..	1	..	..	..	1
Woodbridge	..	1	..	..	..	...	..	..	..	1	...	..	..	1	..	...	1	..	..	..	2	..	..	..	2
Totals	65	64	3	4	5	115	73	61	..	213	177	2	3	108	..	68	45	8	32	2	112	..	32	89	96

CLASS. III.—LOCAL DISEASES—Concluded.

Towns in New Haven Co.	Order 4.—Digestive Organs. Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Intussusception.	Fistula.	Strict. Œsoph.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Order 4.—Urinary Organs. Nephritis.	Bright's Disease.	Diabetes.	Gravel.	Cystitis.	Kidney Disease.	Uræmia.	Prostatitis.	Total. M.	Total. F.	Order 6.—Generative Organs. Ovarian Dropsy.	Ovarian Tumor.	Disease of Uterus.	Total.	Order 7.—Organs of Locomotion. Joint Diseases.	Caries.	Necrosis.	Total. M.	Total. F.	Order 8.—Integumentary System. Phlegmon.	Ulcer.	Tumor.	Skin Diseases.	Total. M.	Total. F.	Total for Class III. Males.	Females.	Total.
New Haven	10	6	10	2	3	4	..	..	2	5	4	8	..	23	31	2	18	2	..	2	10	..	..	21	13	2	..	1	3	1	..	..	..	1	..	2	..	..	1	1	253	205	458
Beacon Falls																																											
Bethany												1		1																											1	...	1
Branford																																									7	9	16
Cheshire												1		1				1						1																	5	5	10
Derby	1	1	2			1			1			2		2	6	1									1																14	28	42
East Haven																																									8	4	12
Guilford	1	2												1	2																										7	8	15
Hamden																																									8	5	13
Madison						1								1							1				1					1			1								3	3	6
Meriden	1	1			1				4			6		9	4	1	5	2			2			4	6													2	2		50	49	99
Middlebury																																									1	1	2
Milford																																									4	8	12
Naugatuck												2		1	1		1							1		1	1		2												8	6	14
North Branford																	1							1																	3	...	3
North Haven																																									1	4	5
Orange		2												1	1																										8	8	16
Oxford		1													1								1	1																	3	3	6
Prospect																																									2	...	2
Seymour					1										1				1						1										1						5	2	7
Southbury																																									3	1	4
Wallingford	2							1	1					3	1		1						2	3				1	1								1			1	14	5	19
Waterbury	2		2	1	2							2		3	6		5							3	2																48	44	92
Wolcott												1		1																											2	1	3
Woodbridge																																									1	3	4
Totals	17	13	14	3	7	6	..	1	8	5	4	23	..	47	54	4	31	5	1	2	13	..	3	35	24	3	1	2	6	2	..	..	1	1	1	2	1	2	3	2	459	402	861

Towns in New Haven Co.	Class IV.—Developmental Diseases. Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Spina Bifida.	Malformation.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Metritis.	Childbirth.	Total.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4.—Of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
New Haven	64	37	..	..	5	5	69	42	..	1	1	13	26	4	8	86	80	166
Beacon Falls	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	1
Bethany	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1	1	2
Branford	5	3	..	..	1	..	5	4	..	1	1	..	1	1	..	6	6	12
Cheshire	5	1	..	..	..	..	4	2	..	..	..	1	3	..	..	5	5	10
Derby	13	3	..	..	..	..	5	11	..	..	..	1	4	..	2	6	14	20
East Haven	5	1	..	..	..	..	4	2	..	..	..	2	4	..	..	6	6	12
Guilford	2	..	..	..	..	..	1	1	..	..	..	4	3	..	..	5	4	9
Hamden	2	..	1	..	..	..	2	1	..	1	1	1	1	..	..	3	3	6
Madison	..	..	..	..	..	..	..	..	..	..	..	..	2	..	2	..	4	4
Meriden	14	12	..	..	..	2	20	8	..	1	1	2	4	2	3	24	16	40
Middlebury	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	1
Milford	2	..	1	..	..	..	2	1	..	..	..	2	3	..	..	4	4	8
Naugatuck	6	3	..	..	..	..	4	5	..	..	..	4	3	..	..	8	8	16
North Branford	..	..	..	..	..	..	..	..	..	..	..	1	..	1	1	2	1	3
North Haven	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Orange	2	..	..	..	1	..	1	2	..	..	..	..	1	..	1	1	4	5
Oxford	..	..	..	..	..	1	1	..	..	..	..	1	1	..	..	2	1	3
Prospect	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	2	..	2
Seymour	3	..	..	..	..	..	3	..	..	..	..	1	..	..	..	4	..	4
Southbury	2	..	..	..	..	..	..	2	..	..	..	2	1	..	..	2	3	5
Wallingford	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	1	1	2
Waterbury	11	7	..	..	1	..	6	13	..	1	1	5	6	..	..	11	20	31
Wolcott	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	1
Woodbridge	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1	1	2
Totals	136	67	2	..	8	8	127	94	..	5	5	46	67	8	18	180	185	365

Towns in New Haven Co.	Class V.—Violent Deaths. Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Accidents.	Railway Injury.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 2, 3, 4. Order 3—Homicide. M.	Order 3—Homicide. F.	Order 4—Suicide. M.	Order 4—Suicide. F.	Sudden. M.	Sudden. F.	Sudden Cause, unascertained. M.	Sudden Cause, unascertained. F.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.
New Haven	18	6	7	2	7	..	..	2	..	32	10	..	..	6	3	..	..	..	6	38	19	57	585	568	1153
Beacon Falls	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	1	..	6	6
Bethany	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	1	5
Branford	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	1	1	22	27	49
Cheshire	..	..	..	..	..	..	1	..	..	1	..	..	..	..	1	..	..	..	2	2	2	4	15	30	35
Derby	..	..	..	..	..	..	..	1	2	2	1	..	..	1	..	..	..	1	..	4	1	5	18	100	178
East Haven	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	18	11	29
Guilford	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	1	..	1	18	20	38
Hamden	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	1	..	2	2	25	20	45
Madison	..	..	..	..	2	..	..	..	1	3	..	..	1	..	..	..	..	..	..	3	1	4	12	14	26
Meriden	1	..	1	2	3	..	..	1	2	4	6	..	1	..	1	3	1	9	12	16	21	37	189	178	367
Middlebury	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1	..	2	1	3	6	6	12
Milford	..	..	2	..	1	..	2	..	..	3	2	..	..	..	..	..	1	2	2	5	5	10	31	38	69
Naugatuck	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	2	30	29	59
North Branford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	1	6	4	10
North Haven	..	..	..	..	..	..	..	..	1	1	..	1	..	..	1	..	..	..	..	2	1	3	7	14	21
Orange	..	..	..	..	..	..	1	..	..	1	..	1	..	..	..	..	..	2	..	3	1	4	19	25	44
Oxford	..	..	..	..	..	1	..	..	..	1	..	1	..	..	..	..	..	..	..	2	..	2	10	8	18
Prospect	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	2	7
Seymour	..	..	..	..	..	..	..	1	..	..	1	..	..	1	..	..	..	..	..	1	1	2	19	18	37
Southbury	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	1	..	2	..	2	12	5	17
Wallingford	..	..	..	1	..	..	..	..	30	16	15	..	..	..	1	..	..	..	..	17	15	32	47	38	85
Waterbury	..	..	..	..	2	..	..	..	2	1	3	..	..	..	..	..	..	..	1	1	4	5	121	113	234
Wolcott	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	2	5
Woodbridge	..	..	1	..	..	1	..	..	..	..	2	..	..	..	..	..	..	..	..	..	2	2	2	11	13
Totals	19	6	11	5	15	3	4	6	40	68	41	3	2	9	8	3	2	16	28	107	73	180	1293	1269	2562

CLASS I.—ZYMOTIC DISEASES.

Towns in New London Co.	Order 1.—Miasmatic. Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Eclampsia.	Carbuncle.	Pyaemia.	Septicaemia.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Congestive Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Order 2.—Enthetic. Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Order 3.—Dietic. Privation.	Purpura.	Alcoholism.	Intemperance.	Total. M.	Total. F.	Total for Class 1. Males.	Females.	Total.
New London	..	..	19	4	..	6	..	..	..	..	..	..	1	..	6	....	..	....	..	1	....	18	19	...	...	...	...	...	4	..	..	1	3	2	21	21	42
Norwich	4	1	21	9	..	12	3	1	..	..	..	..	2	5	46	....	..	....	..	1	2	60	47	...	...	...	...	...	..	..	..	1	1	...	61	47	108
Bozrah	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	....	..	....	..	..	....	...	1	...	...	...	...	...	..	..	..	..	...	...	...	1	1
Colchester	..	..	20	2	..	2	..	..	..	..	..	..	..	..	..	....	..	....	..	..	1	11	14	...	...	...	...	...	..	..	..	..	...	...	11	14	25
East Lyme	..	..	..	..	..	2	2	..	..	..	..	..	..	..	..	....	..	....	..	..	....	1	3	...	...	...	...	...	..	..	..	..	...	...	1	3	4
Franklin	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	....	..	....	..	..	....	2	...	...	...	...	...	...	..	..	..	..	...	...	2	...	2
Griswold	..	..	1	1	..	..	..	..	..	..	..	..	1	..	..	....	..	....	..	..	....	2	1	...	...	...	...	...	..	..	..	..	...	...	2	1	3
Groton	..	..	..	..	..	1	2	..	..	..	..	..	1	1	2	....	..	1	..	..	....	6	2	...	...	...	...	...	..	..	..	..	...	...	6	2	8
Lebanon	..	..	1	..	..	1	1	..	..	..	..	..	..	..	..	....	..	....	..	..	1	1	3	...	...	...	...	...	..	..	..	..	...	...	1	3	4
Ledyard	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	..	....	..	..	....	...	...	...	...	...	...	...	..	..	..	..	...	...	...	...	...
Lisbon	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	....	..	....	..	..	....	...	1	...	...	...	1	...	..	..	..	..	...	...	...	1	1
Lyme	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	....	..	....	..	..	....	1	...	...	...	...	...	...	..	..	..	..	...	...	1	...	1
Montville	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	....	..	....	..	..	....	1	...	...	...	...	...	...	..	..	..	..	...	...	1	...	1
No. Stonington	..	1	19	..	..	1	..	..	..	..	..	..	..	1	..	....	..	....	..	1	1	14	10	...	...	...	...	...	..	..	..	..	...	...	14	10	24
Old Lyme	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	..	....	..	..	....	2	...	1	...	...	...	...	..	..	..	..	...	...	3	...	3
Preston	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	....	..	....	..	..	....	...	2	...	...	...	...	...	..	..	..	..	...	...	...	2	2
Salem	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	..	....	..	..	....	...	...	...	...	...	...	...	..	..	..	..	...	...	...	...	...
Sprague	1	..	4	..	..	..	..	..	..	..	..	..	..	..	5	....	..	1	..	..	....	6	5	...	...	...	...	...	..	..	..	1	1	...	7	5	12
Stonington	..	..	12	1	..	3	1	..	..	..	..	..	1	1	1	....	..	....	..	..	1	12	9	...	...	...	...	...	..	..	..	..	...	...	12	9	21
Waterford	..	..	..	..	..	..	..	..	..	..	..	..	1	..	3	....	..	....	..	..	....	3	1	...	...	...	...	...	..	..	..	..	...	...	3	1	4
Totals	5	3	98	18	..	30	9	1	..	..	..	..	7	11	64	1	..	2	..	3	6	140	118	1	...	...	1	...	4	..	..	3	5	2	146	120	266

CLASS II.—CONSTITUTIONAL DISEASES.

Towns in New London Co.	Order 1.—Diathetic. Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Marasmus.	Phthisis.	Hydrocephalus.	Peritonitis.	Meningitis.	Total. M.	Total. F.	Total for Class II. Males.	Females.	Total.
New London..	4	9	..	5	8	3	..	31	1	..	..	14	21	19	29	48
Norwich.....	3	8	..	7	4	4	..	94	13	..	..	47	64	54	68	122
Bozrah........	....	1	..	..	1	..	..	1	..	..	..	..	1	..	2	2
Colchester.....	1	3	..	1	3	..	..	12	..	..	..	5	7	6	10	16
East Lyme....	....	..	..	..	..	..	..	5	..	..	..	2	3	2	3	5
Franklin.......	1	..	..	1	..	..	..	1	..	..	..	..	1	1	1	2
Griswold.......	....	..	..	..	..	..	..	5	1	..	..	4	2	4	2	6
Groton........	3	3	..	4	2	..	..	10	..	..	..	5	5	9	7	16
Lebanon	....	2	..	..	2	..	..	2	..	..	..	2	..	2	2	4
Ledyard.......	....	2	..	1	1	..	..	3	..	..	..	2	1	3	2	5
Lisbon........	....	2	..	..	2	..	..	4	..	..	..	2	2	2	4	6
Lyme.........	....	1	1	1	1	..	..	1	..	..	..	..	1	1	2	3
Montville......	....	..	..	..	..	..	..	3	..	..	..	1	2	1	2	3
No. Stonington.	....	1	..	..	1	..	..	6	..	..	..	3	3	3	4	7
Old Lyme.....	....	1	..	1	..	..	..	1	..	..	..	1	..	2	..	2
Preston........	1	..	..	1	..	..	..	7	..	..	..	3	4	4	4	8
Salem.........	....	1	..	..	1	..	..	1	..	..	..	..	1	..	2	2
Sprague.......	2	..	..	2	..	1	..	12	..	..	..	6	7	8	7	15
Stonington....	2	4	..	2	4	..	..	7	1	..	..	5	3	7	7	14
Waterford.....	....	..	..	..	..	..	..	3	..	..	..	1	2	1	2	3
Totals....	17	38	1	26	30	8	..	209	16	..	..	102	131	129	160	289

CLASS III.—LOCAL DISEASES.

Towns in New London Co.	Order 1.—Nervous System. Apoplexy.	Paralysis.	Insanity.	Chorea.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total. M.	Total. F.	Order 2.—Organs of Circulation. Pericarditis.	Aneurism.	Heart Disease.	Angina.	Total. M.	Total. F.	Order 3.—Respiratory System. Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
New London..	3	4	2	..	..	..	7	..	4	1	14	7	..	..	14	..	11	3	..	1	..	..	1	5	3	4
Norwich.....	9	27	1	..	2	..	19	9	2	..	40	29	..	6	11	..	10	7	..	..	..	32	..	1	17	16
Bozrah........	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Colchester.....	1	..	..	..	1	..	..	..	..	..	2	..	..	..	3	..	2	1	..	1	..	3	..	..	1	3
East Lyme....	1	..	..	..	..	..	..	1	..	..	1	1	..	..	..	..	..	..	..	..	..	1	..	..	..	1
Franklin.......	2	1	..	..	..	..	..	..	..	..	2	1	..	..	1	..	1	..	..	..	..	..	..	1	1	..
Griswold.......	1	4	1	..	..	..	..	..	..	..	5	1	..	..	1	..	1	..	..	..	..	1	..	..	..	1
Groton........	..	3	1	..	1	..	1	..	2	..	5	3	..	..	4	..	2	2	..	1	..	4	..	..	2	3
Lebanon	..	2	..	..	..	..	..	..	1	..	1	2	..	..	3	..	1	2	..	..	..	2	..	..	..	2
Ledyard.......	4	2	1	..	..	..	..	..	2	..	4	5	..	..	1	..	..	1	..	..	..	4	..	..	..	4
Lisbon........	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	1	..	1	1	1
Lyme.........	1	..	..	..	..	..	3	1	..	..	3	2	..	..	..	..	..	..	..	..	..	1	..	..	1	..
Montville......	2	..	1	..	..	..	..	..	..	..	..	3	..	..	2	..	1	1	..	1	..	2	..	..	..	3
No. Stonington.	2	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Old Lyme.....	1	1	..	..	..	..	..	..	..	..	1	1	..	..	1	..	1	..	..	..	..	..	..	..	..	..
Preston........	..	2	1	..	..	..	1	..	1	..	4	1	..	..	5	..	1	4	..	..	..	..	..	..	..	..
Salem.........	..	..	1	..	..	..	..	..	..	..	1	..	..	..	2	..	2	..	..	..	..	..	..	..	..	..
Sprague.......	..	2	..	..	..	..	1	..	3	..	3	3	..	..	3	..	3	..	1	..	..	3	..	1	1	4
Stonington....	..	2	..	..	1	..	2	1	1	..	5	2	1	..	5	..	2	4	..	1	..	6	..	..	4	3
Waterford.....	..	3	..	..	..	..	..	..	1	..	1	3	..	..	1	..	1	..	..	..	..	..	..	..	..	..
Totals....	27	53	9	..	5	..	34	12	18	2	94	60	1	6	57	..	39	25	1	5	..	60	1	9	31	45

CLASS III. — LOCAL DISEASES — Concluded.

Towns in New London Co.	Order 4.—Digestive Organs.															Order 5.—Urinary Organs.										Order 6.—Generative Organs.				Order 7.—Organs of Locomotion.					Order 8.—Integumentary System.						Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Intussusception.	Fistula.	Strict. Œsoph.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Nephritis.	Bright's Disease.	Diabetes.	Gravel.	Cystitis.	Kidney Disease.	Uræmia.	Prostatitis.	Total. M.	Total. F.	Ovarian Dropsy.	Ovarian Tumor.	Disease of Uterus.	Total.	Joint Diseases.	Caries.	Necrosis.	Total. M.	Total. F.	Phlegmon.	Ulcer.	Tumor.	Skin Diseases.	Total. M.	Total. F.	Males.	Females.	Total.
New London	..	1	..	1	..	..	..	..	2	2	..	..	..	2	4	1	..	..	..	..	5	..	..	4	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	34	20	54
Norwich	4	..	2	..	2	..	..	..	6	..	1	1	..	4	12	..	3	..	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	..	..	..	2	..	1	1	74	66	140
Bozrah	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...	1	1
Colchester	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	1	1	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	4	12
East Lyme	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	3	4
Franklin	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	1	5
Griswold	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	2	..	..	..	..	..	..	3	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	9	3	12
Groton	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	2	..	..	2	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	13	8	21
Lebanon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	6	10
Ledyard	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	11	15
Lisbon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	3
Lyme	..	..	..	..	2	..	..	..	..	..	..	..	..	2	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	2	9
Montville	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...	8	8
No. Stonington	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	...	2
Old Lyme	..	..	..	..	1	..	..	..	..	..	1	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	3	5
Preston	1	..	1	..	..	..	..	..	..	..	..	1	..	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	7	13
Salem	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	...	3
Sprague	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	7	14
Stonington	1	1	..	..	..	..	..	..	1	..	..	1	..	..	4	..	3	..	..	1	..	..	..	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15	13	28
Waterford	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	3	6
Totals	7	3	3	1	6	..	..	..	9	3	2	4	..	13	25	2	12	2	..	1	7	..	..	19	5	..	..	.	..	..	..	1	1	..	..	..	2	..	1	1	197	168	365

Towns in New London Co.	CLASS IV.—DEVELOPMENTAL DISEASES. Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Spina Bifida.	Malformation.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Metritis.	Childbirth.	Total.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4.—Of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
New London..	4	3	1	..	..	..	4	4	...	3	3	6	8	4	5	14	20	34
Norwich.....	34	7	..	1	..	1	26	17	...	1	1	10	22	2	2	38	42	80
Bozrah........	..	2	..	..	..	..	2	..	...	...	...	.....	.....	.....	.....	2	..	2
Colchester.....	..	....	..	..	..	..	..	..	...	...	...	2	1	.....	.....	2	1	3
East Lyme....	..	....	1	..	..	..	..	1	...	...	...	2	.....	.....	.....	2	1	3
Franklin.......	..	....	..	..	..	..	..	..	...	...	...	.....	.....	.....	.....	..	..	...
Griswold.......	..	....	..	..	..	..	..	..	...	...	...	.....	1	.....	2	..	3	3
Groton........	..	5	..	..	..	..	4	1	...	...	...	3	4	1	.....	8	5	13
Lebanon......	..	....	..	..	..	..	..	..	...	...	...	.....	.....	.....	.....	..	..	...
Ledyard......	.	2	..	..	..	..	2	..	...	...	...	.....	2	.....	.....	2	2	4
Lisbon........	..	....	..	..	..	..	..	..	...	...	...	.....	.....	1	.....	1	..	1
Lyme..... ...	1	....	..	..	..	..	1	..	...	...	...	.....	.....	.....	.....	1	..	1
Montville......	..	....	..	..	..	..	..	..	...	...	...	1	.....	1	.....	2	..	2
No. Stonington.	..	....	..	..	..	..	..	..	...	...	...	3	4	1	1	4	5	9
Old Lyme.....	2	....	..	..	..	..	1	1	...	...	...	.....	1	.....	.....	1	2	3
Preston.......	..	....	..	..	..	..	..	..	...	...	...	1	1	.....	.....	1	1	2
Salem.........	..	....	..	..	..	..	..	..	...	...	...	1	1	.....	.....	1	1	2
Sprague.......	2	....	..	1	..	..	2	1	...	...	...	.....	1	.....	.....	2	2	4
Stonington....	..	1	..	..	1	..	..	2	...	...	...	1	6	.....	.....	1	8	9
Waterford.....	..	....	..	..	..	..	..	..	...	3	3	.....	.....	.....	.....	..	3	3
Totals....	43	20	2	2	1	1	42	27	...	7	7	30	52	10	10	82	96	178

Towns in New London Co.	CLASS V.—VIOLENT DEATHS. Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Accidents.	Railway Injury.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 2, 3, 4. Order 3—Homicide. M.	Homicide. F.	Order 4—Suicide. M.	Suicide. F.	Sudden. M.	Sudden. F.	Sudden Cause, unascertained. M.	Sudden Cause, unascertained. F.	Sex not stated.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.
New London..	..	..	..	..	4	10	..	..	..	4	10	..	..	..	..	..	..	..	..	19	4	10	33	92	100	211
Norwich.....	2	1	3	2	4	..	..	..	3	12	3	..	..	3	..	1	..	23	4	2	38	7	47	265	230	497
Bozrah........	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	4	6
Colchester.....	..	..	..	1	..	1	..	..	..	2	..	..	..	..	..	..	..	5	1	..	7	1	8	34	30	64
East Lyme....	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	1	..	7	6	..	9	6	15	15	16	31
Franklin.......	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	2	9
Griswold.......	..	..	1	1	..	..	..	..	..	..	2	..	..	..	..	..	..	3	..	..	3	2	5	18	11	29
Groton........	..	..	1	..	1	..	..	..	..	2	..	..	..	..	..	..	1	..	1	..	2	1	3	38	23	61
Lebanon......	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	.	1	..	1	2	3	8	13	21
Ledyard......	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	1	9	16	25
Lisbon........	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	1	1	..	2	1	3	6	8	14
Lyme..... ...	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	..	1	2	3	11	6	17
Montville......	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	1	5	10	15
No. Stonington.	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	3	2	..	3	3	6	26	22	48
Old Lyme.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	5	13
Preston.......	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	7	7	..	8	7	15	19	21	40
Salem.........	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	3	7
Sprague.......	..	..	1	..	2	..	..	..	..	2	1	..	..	1	..	..	..	2	..	..	5	1	6	23	22	51
Stonington....	..	..	..	..	1	..	..	..	..	1	..	..	..	..	1	..	..	6	9	..	7	10	17	42	47	89
Waterford.....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	4	..	2	4	6	9	13	22
Totals....	2	1	6	4	13	13	..	..	4	26	17	..	..	5	2	4	1	59	40	21	93	58	172	647	602	1,270

CLASS I.—ZYMOTIC DISEASES.

Towns in Fairfield Co.	Order 1.—Miasmatic. Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Eclampsia.	Carbuncle.	Pyaemia.	Septicaemia.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Congestive Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Order 2.—Enthetic. Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Order 3.—Dietic. Privation.	Purpura.	Alcoholism.	Intemperance.	Total. M.	Total. F.	Total for Class I. Males.	Females.	Total.
Danbury			2	2		2							1		7					1	2	9	8												9	8	17
Bridgeport		8	75	20	1	9	4						6	1	12	2			2		1	82	59								4		2	2	84	61	145
Bethel			1			1									3							1	4												1	4	5
Brookfield																																					
Darien			3												1	1						3	3												3	3	6
Easton															1							1													1		1
Fairfield				1			1			1					1				1		1		6													6	6
Greenwich		2	1			2	1						1		3	2			1			6	7												6	7	13
Huntington		2	1			1									1							3	2												3	2	5
Monroe																																					
New Canaan						1	1						1	1	1							5													5		5
New Fairfield															1			2				2	1												2	1	3
Newtown						1									1							1	1												1	1	2
Norwalk	1	1	5	4	1	5	1	1					1	1	11	1		3		1	3	27	13	1			1		1				1		29	13	42
Reading				1									1	1	1							1	3												1	3	4
Ridgefield															1								1													1	1
Sherman			1																			1													1		1
Stamford		7	14	2	1	2		1					2	3	5			4		5	3	24	25									1	1		25	25	50
Stratford			1	2			1	1							1	1				1		3	5												3	5	8
Trumbull			5			2		1								1						3	6												3	6	9
Weston																																					
Westport															2			3		1		4	2												4	2	6
Wilton		1				2																1	2												1	2	3
Totals	1	21	109	32	3	28	9	4		1			13	7	54	9		12	5	9	10	177	148	1			1		1		4	1	4	2	182	150	332

Towns in Fairfield Co.	CLASS II.—CONSTITUTIONAL DISEASES.																CLASS III.—LOCAL DISEASES.																									
	Order 1.—Diathetic.					Order 2.—Tubercular.								Total for Class II.			Order 1.—Nervous System.												Order 2.—Organs of Circulation.						Order 3.—Respiratory System.							
	Dropsy and Anæmia.	Cancer.	Mortification.	Total.		Scrofula.	Marasmus.	Phthisis.	Hydrocephalus.	Peritonitis.	Meningitis.	Total.		Males.	Females.	Total.	Apoplexy.	Paralysis.	Insanity.	Chorea.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total.		Pericarditis.	Aneurism.	Heart Disease.	Angina.	Total.		Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total.	
				M.	F.							M.	F.														M.	F.					M.	F.							M.	F.
DANBURY		5		2	3		1	12	2			11	4	13	7	20	1	2					4	1	7		6	9	1		3		3	1	1	2		2		2	1	6
Bridgeport	5	4		5	4	1	3	36	4			27	17	32	21	53	6	3					16	7	18		20	30	2		22		6	18	1	2	2	15	4	11	17	18
Bethel	2				2			8				3	5	3	7	10	1	1							1		1	2										4		3	4	3
Brookfield								2					2		2	2	1	1							1		1	2										1		1	1	1
Darien		1			1			4	1			3	2	3	3	6	1											1			1		1					4			3	1
Easton		1			1										1	1															2			2			1					1
Fairfield		5			5	1		1					2		7	7	1						1		2		1	3			6		3	3		1		4			2	3
Greenwich	3	3	1	4	3			11	1			6	6	10	9	19	4	5							1		4	6			5		3	2		1					1	
Huntington	1				1			3				3		3	1	4		1					1					2			1		1					5		1	2	4
Monroe								2				1	1	1	1	2																				1						1
New Canaan			1	1		1		9				3	7	4	7	11	1	3									1	3			3		2	1				2				2
New Fairfield																		1										1			1		1						2	1	3	
Newtown		3			3			2				2		2	3	5	1	3			2		4		1		7	4			2			2						1	1	
Norwalk	6	3		2	7	1	1	31				12	21	14	28	42	4	8				1	6	4	4		17	10		1	12		10	3		4	1	6		1	8	4
Reading	2			1	1			2				1	1	2	2	4	1	1							1		1	2			1		1									
Ridgefield	1	3		2	2			5				1	4	3	6	9	3										2	1			1		1			1		1		1	1	2
Sherman	1	1		1	1			1					1	1	2	3																				1		1			1	1
Stamford	4	5		5	4			28				15	13	20	17	37	10	4			1		5		6	1	18	9			9		3	6	3	3		7		3	10	6
Stratford		1		1				2				1	1	2	1	3		2							2		1	3										3		1	2	2
Trumbull		1			1			2				2		2	1	3	1	1							1		1	2			1			1								
Weston								3				1	2	1	2	3	1											1								1			1		2	
Westport	3			1	2			5	1			3	3	4	5	9	2	2					1					5			4		2	2				2		1	3	
Wilton	2	1			3			7				4	3	4	6	10	2	1									2	1			3			3				3			1	2
Totals	30	37	2	25	44	4	5	176	9			99	95	124	139	263	41	39			3	1	38	12	45	1	83	97	3	1	77		37	44	5	17	4	60	7	27	63	57

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Fairfield Co.	Order 4.—Digestive Organs.															Order 5.—Urinary Organs.										Order 6.—Generative Organs.				Order 7.—Organs of Locomotion.					Order 8.—Integumentary System.						Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Intussusception.	Fistula.	Strict. Œsoph.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Nephritis.	Bright's Disease.	Diabetes.	Gravel.	Cystitis.	Kidney Disease.	Uræmia.	Prostatitis.	Total. M.	Total. F.	Ovarian Dropsy.	Ovarian tumor.	Disease of Uterus.	Total.	Joint Diseases.	Caries.	Necrosis.	Total. M.	Total. F.	Phlegmon.	Ulcer.	Tumor.	Skin Diseases.	Total. M.	Total. F.	Males.	Females.	Total.
Danbury		2	2											3	1		2							1	1	1			1												14	19	33
Bridgeport	2	8	3		4				3			1		7	14		1		1			1		2	1		2		2												52	83	135
Bethel																		1						1																	6	5	11
Brookfield																																									2	3	5
Darien																	1							1												1			1		6	2	8
Easton																	1							1																	1	3	4
Fairfield	1		1		1									1	2		1							1																	8	11	19
Greenwich					1				3					3	1						3			2	1													1		1	13	11	24
Huntington		1													1							1		1				1	1												4	8	12
Monroe																																										1	1
New Canaan	1														1		3	1		1	1			4	2																7	9	16
New Fairfield																																									4	1	5
Newtown											1	1		1	1		1			1				2						1			1								12	7	19
Norwalk	2	1	3						1	3	2	2		10	4		1	1			1			1	2																46	23	69
Reading		1													1																										2	3	5
Ridgefield									1	1				1	1		1							1																	6	4	10
Sherman																																									1	1	2
Stamford			1						1			1		2	1		1							1																	34	22	56
Stratford				1											1																										3	6	9
Trumbull		1												1																											2	3	5
Weston			1												1																										2	2	4
Westport		1				1								1	1																										6	8	14
Wilton					1									1			1							1																	5	6	11
Totals	6	15	11	1	7	1			9	4	3	5		31	31		14	3	1	2	5	2		20	7	1	2	1	4	1			1			1		1	1	1	236	241	477

Towns in Fairfield Co.	CLASS IV.—DEVELOPMENTAL DISEASES. Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Spina Bifida.	Malformation.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Metritis.	Childbirth.	Total.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4.—Of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
Danbury	9	..	..	..	..	..	6	3	..	..	..	1	11	..	1	7	15	22
Bridgeport	5	12	2	..	1	1	15	6	..	2	2	7	5	1	..	23	13	36
Bethel	2	1	..	..	..	..	2	1	..	1	1	1	5	..	..	3	7	10
Brookfield	..	1	..	..	..	..	1	..	..	..	..	1	1	1	..	3	1	4
Darien	..	2	..	..	..	..	1	1	..	..	..	1	2	..	..	2	3	5
Easton	..	..	..	..	..	..	..	..	..	..	..	2	1	..	3	2	4	6
Fairfield	..	1	..	..	..	..	..	1	..	..	..	4	2	..	..	4	3	7
Greenwich	..	1	..	..	..	..	..	1	..	..	..	8	4	1	2	9	7	16
Huntington	1	..	..	..	..	..	1	..	..	..	..	1	3	..	..	2	3	5
Monroe	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	1	1	2
New Canaan	..	..	..	..	..	..	..	..	..	..	..	..	1	1	1	1	2	3
New Fairfield	..	..	..	..	..	..	..	..	..	..	..	..	2	..	1	..	3	3
Newtown	1	..	..	..	..	..	1	..	..	1	1	3	2	..	1	4	4	8
Norwalk	20	3	..	..	..	..	13	10	..	4	4	2	11	..	3	15	28	43
Reading	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	1
Ridgefield	1	..	..	..	1	..	1	1	..	1	1	3	..	..	..	4	2	6
Sherman	..	1	..	..	..	..	..	1	..	..	..	2	1	1	..	3	2	5
Stamford	3	..	..	..	1	3	6	1	..	2	2	..	5	..	3	6	11	17
Stratford	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	1
Trumbull	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	1	1	2
Weston	2	..	..	..	..	..	1	1	..	..	..	..	2	..	..	1	3	4
Westport	1	1	..	..	..	..	2	..	..	..	..	5	1	1	1	8	2	10
Wilton	..	..	..	..	..	..	..	..	..	1	1	..	2	..	..	..	3	3
Totals	45	23	2	..	3	4	50	27	..	12	12	44	63	7	16	101	118	219

Towns in Fairfield Co.	CLASS V.—VIOLENT DEATHS. Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Accidents.	Railway Injury.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 2, 3, 4. Order 3—Homicide. M.	Order 3—Homicide. F.	Order 4—Suicide. M.	Order 4—Suicide. F.	Sudden. M.	Sudden. F.	Sudden Cause, unascertained. M.	Sudden Cause, unascertained. F.	Sex not stated.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.
Danbury	..	2	..	..	1	2	..	1	..	6	..	..	..	..	..	..	..	23	8	2	29	8	39	72	57	131
Bridgeport	1	1	..	..	..	..	..	..	..	1	1	..	..	3	..	4	3	9	3	6	17	7	30	208	185	399
Bethel	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	3	..	3	16	23	39
Brookfield	..	..	..	..	2	..	..	..	..	2	..	..	..	..	..	..	..	..	1	..	2	1	3	7	7	14
Darien	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	14	11	25
Easton	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	8	12
Fairfield	2	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	1	1	2	13	28	41
Greenwich	..	..	..	..	1	2	..	..	..	3	..	..	..	1	..	..	..	..	..	..	4	..	4	42	34	76
Huntington	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	1	2	..	3	2	5	15	16	31
Monroe	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	1	3	3	6
New Canaan	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17	18	35
New Fairfield	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	6	5	12
Newtown	..	..	..	..	..	4	..	..	..	1	3	1	..	..	..	..	..	..	..	..	2	3	5	21	18	39
Norwalk	3	..	12	..	2	..	..	..	..	14	3	1	..	2	..	..	..	..	..	1	17	3	21	121	95	217
Reading	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	..	..	..	2	1	3	8	9	17
Ridgefield	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	1	1	4	1	6	17	14	32
Sherman	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	2	..	..	3	..	3	9	5	14
Stamford	..	..	..	1	2	1	..	..	..	2	2	..	..	..	1	3	..	9	2	1	14	5	20	99	80	180
Stratford	..	..	1	..	1	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	1	1	2	10	13	23
Trumbull	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	1	8	12	20
Weston	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	7	11
Westport	1	..	3	..	1	2	..	..	..	6	1	..	..	1	..	..	..	1	2	1	8	3	12	30	20	51
Wilton	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	..	2	2	4	12	19	31
Totals	7	3	16	1	10	11	..	1	..	37	12	3	..	10	1	9	4	54	22	13	113	39	165	756	687	1456

CLASS I.—ZYMOTIC DISEASES.

Towns in Windham Co.	Order 1.—Miasmatic. Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Eclampsia.	Carbuncle.	Pyaemia.	Septicaemia.	Influenza.	Dysentery.	Diarrhea.	Cholera.	Cholera Infantum.	Intermittent Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Order 2.—Enthetic. Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Order 3.—Dietic. Privation.	Purpura.	Alcoholism.	Intemperance.	Total. M.	Total. F.	Total for Class 1. Males.	Females.	Total.
Brooklyn				3		2					1						2						2	6												2	6	8
Ashford																																						
Canterbury							1															1	2													2		2
Chaplin						1									1								2													2		2
Eastford	2		3												2								4	3						1					1	4	4	8
Hampton															1							1		2													2	2
Killingly			2	1		7		1									5			1			9	8						1	1			2		11	8	19
Plainfield					3					1			1				2	1					3	5												3	5	8
Pomfret	1	1												1									3													3		3
Putnam		3	1	3		13								3	4	3	7		1	2	2		16	26							1			1		17	26	43
Scotland			3											1									2	2												2	2	4
Sterling																																						
Thompson	4		5			1										1	7						9	9												9	9	18
Voluntown			1	2																			2	1									1	1		3	1	4
Windham			2	7		3								2			9			2	2	1	12	16												12	16	28
Woodstock			3	1	3																1		3	5												3	5	5
Totals	7	4	20	17	6	27	1	1	..	1	1	..	1	7	8	4	32	1	1	5	5	3	69	83	...	...	...	...	...	2	2	..	1	4	1	73	89	157

Towns in Windham Co.	CLASS II.—CONSTITUTIONAL DISEASES. Order 1.—Diathetic. Dropsy, Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Marasmus.	Phthisis.	Hydrocephalus.	Peritonitis.	Meningitis.	Total. M.	Total. F.	Total for Class II. Males.	Females.	Total.	CLASS III.—LOCAL DISEASES. Order 1.—Nervous System. Cephalitis.	Apoplexy.	Paralysis.	Insanity.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total. M.	Total. F.	Order 2.—Organs of Circulation. Pericarditis.	Aneurism.	Heart Disease.	Angina.	Total. M.	Total. F.	Order 3.—Respiratory System. Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
Brooklyn	1	1	..	1	1	1	1	4	..	..	..	4	2	5	3	8	..	..	..	1	..	..	..	1	..	..	1	1	..	..	3	..	2	1	..	..	..	1	..	..	..	1
Ashford	..	1	..	1	..	1	..	..	..	..	..	..	1	1	1	2	..	..	1	..	..	..	..	..	1	..	2	..	..	..	1	..	1	..	..	..	..	1	..	1	1	1
Canterbury	..	..	..	..	..	..	..	1	1	..	..	1	1	1	1	2	..	1	..	..	..	1	..	..	..	..	..	2	..	..	2	..	..	2	..	..	..	4	..	..	..	4
Chaplin	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Eastford	1	..	..	..	1	..	..	6	..	..	..	2	4	2	5	7	..	2	1	..	..	..	..	..	..	..	2	1	..	..	1	..	..	1	..	..	..	1	..	..	1	..
Hampton	..	..	..	..	..	..	..	5	..	..	..	3	2	3	2	5	..	1	..	..	..	..	..	..	..	1	1	1	..	..	..	..	..	..	..	1	..	..	..	..	1	..
Killingly	5	3	..	5	3	..	2	15	1	..	..	11	7	16	10	26	..	3	5	..	..	..	4	2	..	..	10	4	..	..	1	..	1	..	..	..	..	6	..	1	4	3
Plainfield	2	3	..	3	2	..	..	6	1	..	..	4	3	7	5	12	..	..	..	..	..	1	..	..	1	..	2	..	3	..	3	..	3	3	..	..	..	2	..	..	2	..
Pomfret	..	..	1	1	..	..	..	3	..	..	..	1	2	2	2	4	..	..	1	..	..	..	..	1	2	..	2	2	..	..	1	..	1	..	..	..	..	3	..	..	3	..
Putnam	2	1	..	1	2	1	..	20	2	..	..	12	11	13	13	26	..	2	..	..	..	..	..	1	5	..	5	3	1	..	5	..	4	2	..	2	..	2	..	1	3	2
Scotland	..	1	..	1	..	..	..	1	..	..	..	..	1	1	1	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1
Sterling	..	..	..	..	..	..	..	1	..	..	..	..	1	..	1	1	..	..	..	..	..	..	1	..	..	..	1	..	..	..	1	..	..	1	..	..	..	1	..	..	..	1
Thompson	2	3	..	5	..	3	..	7	1	..	..	3	8	8	8	16	1	3	1	..	..	..	1	1	4	..	6	5	..	1	1	..	2	..	..	1	..	5	..	..	2	4
Voluntown	..	..		..	..	..	..	3	..	..	..	2	1	2	1	3	..	..	1	..	..	..	..	..	..	..	1	..	..	..	4	..	3	1	..	..	..	1	..	..	..	1
Windham	2	1	1	3	1	1	..	27	..	..	..	11	17	14	18	32	..	4	2	..	..	..	2	..	1	..	6	3	..	..	3	..	1	2	..	..	..	1	..	..	..	1
Woodstock	1	1	..	..	2	..	..	4	1	..	..	2	3	2	5	7	..	..	..	..	..	..	..	..	1	..	..	1	..	..	4	..	3	1	..	4	..	6	..	..	5	5
Totals	16	15	2	21	12	7	3	103	7	..	..	56	64	77	76	153	1	17	12	1	..	2	8	6	15	1	40	23	4	1	30	..	21	14	..	8	..	35	..	3	22	24

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Windham Co.	Order 4.—Digestive Organs.															Order 5.—Urinary Organs.										Order 6.—Generative Organs.				Order 7.—Organs of Locomotion.					Order 8.—Integumentary System.						Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Intussusception.	Fistula.	Strict. Œsoph.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Nephritis.	Bright's Disease.	Diabetes.	Gravel.	Cystitis.	Kidney Disease.	Uræmia.	Prostatitis.	Total. M.	Total. F.	Ovarian Dropsy.	Ovarian tumor.	Disease of Uterus.	Total.	Joint Diseases.	Caries.	Necrosis.	Total. M.	Total. F.	Phlegmon.	Ulcer.	Tumor.	Skin Diseases.	Total. M.	Total. F.	Males.	Females.	Total.
Brooklyn	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	3	8
Ashford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	5	1	6
Canterbury	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	8	10
Chaplin	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	2
Eastford	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	2	5
Hampton	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	1	4
Killingly	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15	8	23
Plainfield	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	7	5	12
Pomfret	..	1	1	..	1	..	..	..	..	..	..	2	..	2	3	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	5	13
Putnam	1	2	..	1	..	..	..	..	1	..	..	2	..	3	4	..	1	1	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	17	11	28
Scotland	..	..	1	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2
Sterling	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	2	3
Thompson	..	..	..	1	1	..	..	..	1	..	..	..	..	2	1	..	1	1	1	1	..	..	..	3	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	15	11	26
Voluntown	..	2	1	..	..	..	..	..	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	6	3	9
Windham	..	1	1	..	..	1	..	..	1	..	..	2	..	4	2	..	3	..	..	..	..	..	..	2	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	13	9	22
Woodstock	..	..	..	..	..	..	..	..	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	8	16
Totals	3	6	4	2	2	1	..	..	5	..	..	8	..	16	15	..	8	2	1	3	..	..	..	10	4	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	109	80	189

CLASS IV.—DEVELOPMENTAL DISEASES.

Towns in Windham Co.	Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Spina Bifida.	Malformation.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Metritis.	Childbirth.	Total.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4.—Of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
Brooklyn		2					2	1		1	1		1			1	3	4
Ashford	1							1				2		1	1	3	2	5
Canterbury												1		1		2		2
Chaplin													1				1	1
Eastford												1				1		1
Hampton													3				3	3
Killingly	10	16					19	7				7	4			26	11	37
Plainfield	2						2									2		2
Pomfret	3						3					2	2			5	2	7
Putnam		1				2	3					2	2	1		6	2	8
Scotland													1				1	1
Sterling														1		1		1
Thompson	3	1					1	3		1	1			1		2	4	6
Voluntown		1					1						3			1	3	4
Windham		12					8	4				1	6	3	1	12	11	23
Woodstock													1				1	1
Totals	19	33				2	38	16		2	2	16	24	8	2	62	44	106

CLASS V.—VIOLENT DEATHS.

Towns in Windham Co.	Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Accidents.	Railway Injury.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 2, 3, 4. Order 3—Homicide. M.	Order 3—Homicide. F.	Order 4—Suicide. M.	Order 4—Suicide. F.	Sudden. M.	Sudden. F.	Sudden Cause, unascertained. M.	Sudden Cause, unascertained. F.	Sex not stated.	Total for Class V. Males.	Females.	Total.
Brooklyn		2								2								1			3		3
Ashford									1	1									1		1	1	2
Canterbury																		1	1		1	1	2
Chaplin									1		1											1	1
Eastford				1	1					2											2		2
Hampton												1									1		1
Killingly																		1			1		1
Plainfield					1					1								3			4		4
Pomfret																		1			1		1
Putnam	1										1							2	10	3	2	11	16
Scotland																							
Sterling																		2			2		2
Thompson						3				3				1	1			13	5	1	17	6	24
Voluntown				1					1		2											2	2
Windham														1				6	12	2	7	12	21
Woodstock																							
Totals	1	2		2	3	3			3	9	4	1		2	1			30	29	6	42	34	82

Grand Total for All Classes.

Towns in Windham Co.	Males.	Females.	Total.
Brooklyn	16	15	31
Ashford	10	5	15
Canterbury	8	10	18
Chaplin	3	3	6
Eastford	12	11	23
Hampton	6	9	15
Killingly	63	37	106
Plainfield	23	15	38
Pomfret	19	9	28
Putnam	55	63	121
Scotland	3	6	9
Sterling	4	3	7
Thompson	51	38	90
Voluntown	11	11	22
Windham	58	66	126
Woodstock	13	19	32
Totals	363	318	687

Towns in Litchfield Co.	Class I.—Zymotic Diseases. Order 1.—Miasmatic. Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Eclampsia.	Carbuncle.	Pyaemia.	Septicaemia.	Influenza.	Dysentery.	Diarrhea.	Cholera.	Cholera Infantum.	Intermittent Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Order 2.—Enthetic. Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Order 3.—Dietic. Privation.	Purpura.	Alcoholism.	Intemperance.	Total. M.	Total. F.	Total for Class 1. Males.	Females.	Total.
Litchfield			2			6									3								4	7												4	7	11
Barkhamsted		1	1																				2													2		2
Bethlehem																																						
Bridgewater							1																1													1		1
Canaan			1																				1													1		1
Colebrook																																						
Cornwall																	1						1													1		1
Goshen						2																	1	1												1	1	2
Harwinton			1	1			1							1									3	1												3	1	4
Kent						1								1	1								2	1												2	1	3
Morris			1																					1													1	1
New Hartford			2		1	1												1				3	5	3												5	3	8
New Milford			1			2											1		1				2	3												2	3	5
Norfolk				1										1										2		1			1					1		1	3	4
North Canaan			4	2																			2	4												2	4	6
Plymouth			2			2											1		1				4	2												4	2	6
Roxbury						1																		1													1	1
Salisbury			1			1		1						1			1	1				1	5	2												5	2	7
Sharon			2			4								2	1							1	5	5												5	5	10
Thomaston			1	1													3						4	1												4	1	5
Torrington		2				3								3	1		3						9	3												9	3	12
Warren			4														1						3	2												3	2	5
Washington		1	1																				1	1												1	1	2
Watertown							1							1			1						1	2												1	2	3
Winchester		7	20	1		1								1			3	1					17	19												17	19	39
Woodbury						3																	1	2												1	2	3
Totals		11	44	6	1	27	3	1						11	6		15	3	2			5	74	63		1			1					1		75	64	139

Towns in Litchfield Co.	Class II.—Constitutional Diseases.																Class III.—Local Diseases.																										
	Order 1.—Diathetic.					Order 2.—Tubercular.								Total for Class II.			Order 1.—Nervous System.												Order 2.—Organs of Circulation.						Order 3.—Respiratory System.							
	Dropsy, Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Scrofula.	Marasmus.	Phthisis.	Hydrocephalus.	Peritonitis.	Meningitis.	Total. M.	Total. F.	Males.	Females.	Total.	Cephalitis.	Apoplexy.	Paralysis.	Insanity.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total. M.	Total. F.	Pericarditis.	Aneurism.	Heart Disease.	Angina.	Total. M.	Total. F.	Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
Litchfield	..	1	..	..	1	..	..	3	..	..	..	2	1	2	2	4	..	1	..	..	..	..	1	..	..	..	1	1	..	..	4	..	3	1	..	..	..	3	..	..	1	2
Barkhamsted	..	..	..	..	..	..	..	1	..	..	..	..	1	..	1	1	..	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	1	..	2	2	1
Bethlehem	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bridgewater	..	..	..	..	..	..	..	1	..	..	..	1	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Canaan	..	1	..	..	1	..	..	..	..	..	..	..	1	..	1	1	..	..	..	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	1	..	2	..	..	1	2
Colebrook	..	..	..	..	..	..	..	1	..	..	..	..	1	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..
Cornwall	..	..	..	..	..	..	..	1	..	..	..	..	1	..	1	1		5	..	1	..	..	1	..	..	..	4	3	..	..	1	..	..	1	..	..	..	1	..	..	..	1
Goshen	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	2	1	..	..	..	1	..	..	..	..	1	..	..	1	..
Harwinton	1	..	..	..	1	..	..	5	..	..	..	2	3	2	4	6	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..
Kent	..	1		..	1	1	..	4	..	..	..	2	3	2	4	6	..		..	..	..		..	..	..	..	..	..	..	..	3	..	3	..	..	..	..	..	..		..	..
Morris	1	1	..	1	1	..	..	2	..	..	..	1	1	2	2	4	..	1	1	..	..	..	..	1	..	..	2	1	..			..	..	..	..	..	..	2	..	..	1	1
New Hartford	..	1	..	1	..	..	..	10	..	..	..	2	8	3	8	11	..	1	5	1	..	..	..	..	3	..	8	2	..		3	..	1	2	..	1	..	3	..	..	2	2
New Milford	..	1		..	1	..	..	5	..	..	..	2	3	2	4	6	..	1	2	..	..	..	..		1	..	3	1	..	..	5	..	2	3	..	..	..	..	..	..	..	..
Norfolk	1			..	1	..	..	3	..	..	..	2	1	2	2	4	..	1	1	..	..	..	1	..	1	..	1	3	..	..	..	..	..	..	..	..	1	2	..	1	2	2
North Canaan	1	..	..	..	1	..	..	..	..	..	..	..	..	..	1	1	..		5	..	..	..	..	..	..	..	1	4	..	..	1	..	1	..	..	..		2	..	..	1	1
Plymouth	1	1	..	..	2	..	..	1	..	..	..	1	..	1	2	3	..	..	1	..	..	..	1	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Roxbury	1	..	..	..	1	..	..	2	..	..	..	1	1	1	2	3	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	4	..	..	3	1
Salisbury	..	1	..	..	1	..	..	6	..	..	..	3	3	3	4	7	..	3	..	..	1	..	..	..	3	..	1	6	1	..	1	..	1	1	..	..	..	4	..	..	4	..
Sharon	..	1	..	..	1	..	..	3	..	..	..	2	1	2	2	4	..	2	..	..	..	..	1	..	..	..	1	2	..	..	2	..	2	..	..	1	..	1	..	1	3	..
Thomaston	..	..	..	..	..	..	..	5	1	..	..	1	5	1	5	6	..	1	1	..		..	..	4	2		5	3	..	..	..	..	..	..	..	..	1	1	..	..	1	1
Torrington	3	4	1	2	6	..	..	9	..	..	..	7	2	9	8	17	..	3	..	..	..	..	3	..	4	..	5	5	1	..	..	..	1	..	..	..	..	1	..	1	1	1
Warren	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Washington	..	3	.	2	1	..	2	1	..	..	..	2	1	4	2	6	..	..	1	..	..	..	1	..	..	..	..	2	..	..	2	..	2	..	..	..	..	1	..	..	..	1
Watertown	2	..	..	1	1	..	..	6	..	..	..	3	3	4	4	8	..	1	..	..	..	..	..	1	..	..	..	2	..	..	2	..	..	2	..	..	..	..	..	..	..	..
Winchester	4	1	..	3	2	..	..	12	..	..	..	8	4	11	6	17	..	1	1	..	..	..	1	..	..	..	..	3	..	..	..	..	..	..	..	..	..	2	1	2	3	2
Woodbury	..	1	..	..	1	..	..	5	..	..	..	4	1	4	2	6	..	4	1	..	..	..	..	..	1	..	4	2	..	..	1	..	..	1	..	..	..	2	..	1	1	2
Totals	15	18	1	10	23	1	2	86	1	..	..	46	45	56	68	124	..	27	20	2	1	1	11	6	16	..	39	45	3	..	25	..	17	11	..	3	2	35	1	8	29	20

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Litchfield Co.	Order 4.—Digestive Organs.															Order 5.—Urinary Organs.										Order 6.—Generative Organs.				Order 7.—Organs of Locomotion.					Order 8.—Integumentary System.						Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Intussusception.	Fistula.	Strict. Œsoph.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Nephritis.	Bright's Disease.	Diabetes.	Gravel.	Cystitis.	Kidney Disease.	Uræmia.	Prostatitis.	Total. M.	Total. F.	Ovarian Dropsy.	Ovarian Tumor.	Disease of Uterus.	Total.	Joint Diseases.	Caries.	Necrosis.	Total. M.	Total. F.	Phlegmon.	Ulcer.	Tumor.	Skin Diseases.	Total. M.	Total. F.	Males.	Females.	Total.
Litchfield			2											1	1		1			1				1	1												1			1	7	7	14
Barkhamsted			2											1	1																										3	3	6
Bethlehem																	1								1																1	1	2
Bridgewater																																									...	...	...
Canaan																																									2	2	4
Colebrook																	1		1					2			1		1												2	1	3
Cornwall											1			1			1	1						2																	7	5	12
Goshen			1											1																											3	2	5
Harwinton																																									1	...	1
Kent			1												1																										3	1	4
Morris					1										1																										3	3	6
New Hartford			1									1		1	1			1	1					1	1													1	1		14	8	22
New Milford		1													1					1				1																	6	5	11
Norwalk																																									3	5	8
North Canaan												1		1																											4	5	9
Plymouth			1												1																										..	3	3
Roxbury																																									4	1	5
Salisbury			1		1									1	1															1			1								8	8	16
Sharon																															1	1	1								7	2	9
Thomaston		2	1			1								2	2																						1		1		9	6	15
Torrington												1			1		3							3																	10	7	17
Warren	1													1																											1	...	1
Washington																															1	1		1							2	4	6
Watertown																																									...	4	4
Winchester																	2							2																	5	5	10
Woodbury									1			1			2																										5	7	12
Totals	1	3	10	....	2	1	..	..	1	..	1	4	..	10	13	..	9	2	2	2	..	..	..	12	3	..	1	.	1	1	2	2	2	1	..		2	1	2	1	111	95	206

Towns in Litchfield Co.	CLASS IV.—DEVELOPMENTAL DISEASES. Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Spina Bifida.	Malformation.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Metritis.	Childbirth.	Total.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4.—Of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
Litchfield		1				1		2				1	2	1		2	4	6
Barkhamsted													2				2	2
Bethlehem		1			1		2									2		2
Bridgewater												1	3			1	3	4
Canaan		1					1			1	1					1	1	2
Colebrook																		
Cornwall													2				2	2
Goshen	2						2						1			2	1	3
Harwinton													2				2	2
Kent																		
Morris																		
New Hartford		1					1						1			1	1	2
New Milford	3	1					3	1				3	7			6	8	14
Norfolk	1							1		1	1		1				3	3
North Canaan														1		1		1
Plymouth																		
Roxbury		1						1					2				3	3
Salisbury																		
Sharon												2	1			2	1	3
Thomaston	1	1					1	1		1	1					1	2	3
Torrington		3					1	2				1	1			2	3	5
Warren																		
Washington												1	1			1	1	2
Watertown													1				1	1
Winchester		1					1					1	4			2	4	6
Woodbury										1	1		1				2	1
Totals	7	11			1	1	12	8		4	4	10	32	2		24	44	68

Towns in Litchfield Co.	CLASS V.—VIOLENT DEATHS. Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Accidents.	Railway Injury.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 2, 3, 4. Order 3—Homicide. M.	Order 3—Homicide. F.	Order 4—Suicide. M.	Order 4—Suicide. F.	Sudden. M.	Sudden. F.	Sudden Cause, unascertained. M.	Sudden Cause, unascertained. F.	Sex not stated.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.
Litchfield																		1	3		1	3	4	16	23	39
Barkhamsted	1					1				2											2		2	7	6	13
Bethlehem																1		1			2		2	5	1	6
Bridgewater																								3	3	6
Canaan					1						1											1	1	4	5	9
Colebrook																1		1	3		2	3	5	4	5	9
Cornwall																								8	8	16
Goshen																				1			1	6	4	11
Harwinton																	1		1			2	2	6	9	15
Kent																								7	6	13
Morris						1				1						1					2		2	7	6	13
New Hartford					1	6				6	1										6	1	7	29	21	50
New Milford									1	1			1					2	1		3	2	5	19	22	41
Norfolk																				1			1	6	13	20
North Canaan						3				3								2			5		5	13	9	22
Plymouth												1						2	1		3	1	4	8	8	16
Roxbury						1					1											1	1	5	8	18
Salisbury	1									1				1				1	1	1	3	1	5	19	15	35
Sharon																								16	10	26
Thomaston														1							1		1	16	14	30
Torrington				1							1											1	1	30	22	52
Warren																		1			1		1	5	2	7
Washington							1				1											1	1	8	9	17
Watertown						1					1								1			2	2	5	13	18
Winchester							7		2	5	4									1	5	4	10	40	38	79
Woodbury																			3	3		3	6	10	16	29
Totals	2			1	2	13	8		3	19	10	1	1	2		3	1	11	14	7	36	26	69	302	296	605

CLASS I.—ZYMOTIC DISEASES.

Towns in Middlesex Co.	Order 1.—Miasmatic.																							Order 2.—Enthetic.					Order 3.—Dietic.						Total for Class I.		
	Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Eclampsia.	Carbuncle.	Pyaemia.	Septicaemia.	Influenza.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Privation.	Purpura.	Alcoholism.	Intemperance.	Total. M.	Total. F.	Males.	Females.	Total.
Middletown	..	..	9	5	1	8	3	..	..	1	..	..	..	1	2	10	1	2	1	..	..	21	23	..	..	..	..	..	..	1	..	..	..	1	21	24	45
Haddam	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	3	..	..	..	..	..	..	..	..	..	..	..	..	3	3
Chatham	..	..	1	..	..	1	..	..	..	..	..	..	1	..	3	..	..	..	..	..	..	3	3	..	..	..	..	..	..	..	..	..	..	..	3	3	6
Chester	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	1	1	..	..	..	..	2	2	..	..	..	..	..	..	..	..	..	..	..	2	2	4
Clinton	..	..	2	..	1	..	..	..	..	..	..	..	..	..	1	..	..		..	..	1	4	1	..	..	..	..	..	..	..	..	..	..	..	4	1	5
Cromwell	..	..	4	..	..	3	..	..	..	..	..	..	..	2	..	1	1	..	..	..	..	2	9	..	..	..	..	..	..	..	..	..	..	..	2	9	11
Durham	..	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	1	1	2
East Haddam	..	..	..	..	..	3	..	..	..	..	..	..	..	2	..	..	1	..	..	..	..	5	1	..	..	..	..	..	..	..	..	..	..	..	5	1	6
Essex	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	2	..	2
Killingworth	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	1	1	2
Middlefield	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	..	..	..	..	..	1	2	..	..	..	..	..	..	..	..	..	..	..	1	2	3
Old Saybrook	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	2	2	..	..	..	..	2	4	..	..	..	..	..	..	..	..	..	..	..	2	4	6
Portland	..	2	3	2	..	4	..	1	..	..	..	..	..	8	..	3	..	..	..	..	..	6	17	..	..	..	..	..	..	..	..	..	..	..	6	17	23
Saybrook	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	2	1	..	..	..	1	3	2	..	..	..	..	..	..	..	..	..	..	..	3	2	5
Westbrook	..	..	..	..	..	2	..	..	..	..	..	..	..	4	..	1	..	..	..	..	..	3	4	..	..	..	..	..	..	..	..	..	..	..	3	4	7
Totals	..	2	19	8	2	25	3	3	..	1	..	..	1	20	8	20	10	2	2	..	2	56	73	..	..	..	..	..	..	1	..	..	..	1	56	74	130

Towns in Middlesex Co.	CLASS II.—CONSTITUTIONAL DISEASES. Order 1.—Diathetic. Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Marasmus.	Phthisis.	Hydrocephalus.	Peritonitis.	Meningitis.	Total. M.	Total. F.	Total for Class II. Males.	Females.	Total.
Middletown	1	3	1	..	5	1	2	36	2	..	..	18	23	18	28	46
Haddam	2	1	1	3	1	..	..	2	..	..	..	2	..	5	1	6
Chatham	2	2	..	1	3	1	..	3	..	..	..	2	2	3	5	8
Chester	1	1	..	2	..	..	..	3	..	..	..	2	1	4	1	5
Clinton	1	1	..	1	1	..	..	1	..	..	..	..	1	1	2	3
Cromwell	3	1	..	1	3	..	..	2	..	..	..	2	..	3	3	6
Durham	....	1	..	.	1	..	..	1	..	..	..	..	1	...	2	2
East Haddam	....	2	..	1	1	..	..	8	..	..	..	3	5	4	6	10
Essex	1	..	..	..	1	..	..	3	..	..	..	2	1	2	2	4
Killingworth	1	..	..	..	1	..	..	2	..	..	..	2	..	2	1	3
Middlesex	1	..	..	..	1	..	..	...	..	..	..	..	..	...	1	1
Old Saybrook	....	1	..	..	1	..	..	1	..	..	1	1	1	1	2	3
Portland	....	..	..	..	..	..	..	16	..	..	..	6	10	6	10	16
Saybrook	....	..	..	..	..	..	..	2	..	..	..	1	1	1	1	2
Westbrook	2	1	..	..	1	..	..	...	..	..	..	..	..	2	1	3
Totals	15	14	2	11	20	2	2	80	2	..	1	41	46	52	66	118

Towns in Middlesex Co.	CLASS III.—LOCAL DISEASES. Order 1.—Nervous System. Apoplexy.	Paralysis.	Insanity.	Chorea.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total. M.	Total. F.	Order 2.—Organs of Circulation. Pericarditis.	Aneurism.	Heart Disease.	Angina.	Total. M.	Total. F.	Order 3.—Respiratory System. Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
Middletown	10	12	10	..	1	..	1	..	6		20	20	2	..	13	..	5	10	1	1	..	9	..	1	5	7
Haddam	..	..	..	..	..	..	2	..	2	..	2	2	1	..	2	..	1	2	..	..	..	3	..	..	1	2
Chatham	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	...	3	..	..	..	1	..	2	2	1
Chester	..	..	1	..	.	..	..	..	..	..	1	..	..	..	..	..	...	...	..	1	..	3	..	..	4	..
Clinton	..	1	..	..	..	..	..	..	1	..	1	1	..	..	2	..	...	2	..	..	..	...	..	1	1	..
Cromwell	..	..	2	..	1	..	2	..	..	..	3	2	..	..	.	..	...	...	..	..	..	1	..	..	1	..
Durham	..	1	..	..	..	..	..	..	..	..	1	..	..	..	3	..	1	2	..	..	..	1	..	..	1	..
East Haddam	5	3	1	..	..	..	2	1	1	..	7	6	..	..	1	..	...	1	..	..	..	...	..	..	..	..
Essex	1	..	..	..	..	..	..	2	..	..	3	..	..	..	..	..	...	...	..	1	..	...	..	..	..	1
Killingworth	1	1	..	..	..	..	..	..	..	..	..	2	..	..	..	..	...	...	..	..	..	...	..	..	..	..
Middlesex	..	..	..	..	..	..	..	..	1	..	..	1	..	..	..	..	...	...	..	..	..	...	..	..	..	..
Old Saybrook	..	..	.	..	..	..	..	1	2	..	2	1	..	..	2	..	1	1	..	1	..	...	..	..	..	1
Portland	1	1		..	..	..	..	2	1	..	3	2	..	..	6	..	4	2	..	..		3	..	1	2	2
Saybrook	1	1	1	..	..	..	1	..	..	..	3	1	..	..	1	..	1	...	..	..	..	...	..	1	1	..
Westbrook	..	..	..	..	..	..	..	..	3	..	1	2	..	..	1	..	1	...	..	2	..	1	..	..	..	3
Totals	19	20	15	..	2	..	8	6	17	..	47	40	3	..	34	..	14	23	1	6	..	22	..	6	18	17

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Middlesex Co.	Order 4.—Digestive Organs.															Order 5.—Urinary Organs.										Order 6.—Generative Organs.				Order 7.—Organs of Locomotion.					Order 8.—Integumentary System.						Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Intussusception.	Fistula.	Strict. Œsoph.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Nephritis.	Bright's Disease.	Diabetes.	Gravel.	Cystitis.	Kidney Disease.	Uræmia.	Prostatitis.	Total. M.	Total. F.	Ovarian Dropsy.	Ovarian tumor.	Disease of Uterus.	Total.	Joint Diseases.	Caries.	Necrosis.	Total. M.	Total. F.	Phlegmon.	Ulcer.	Tumor.	Skin Diseases.	Total. M.	Total. F.	Males.	Females.	Total.
Middletown	1		3							2	3			4	5		3				1			3	1			1	1	2			1	1							38	45	83
Haddam										1				1																							1			1	5	7	12
Chatham																	1							1																	3	4	7
Chester			1								1				2																										5	2	7
Clinton					1									1																											3	3	5
Cromwell																																									4	2	6
Durham			1								1				2								2	2																	5	4	9
East Haddam			1								1	1		1	2		1			1				2											1				1		11	9	20
Essex			1											1			1			1				2																	6	1	7
Killingworth																																										2	2
Middlefield																											1		1													2	2
Old Saybrook																																									3	3	6
Portland			1									1		1	1																										10	7	17
Saybrook				1											1					1				1																	6	2	8
Westbrook											1				1																										2	6	8
Totals	1		8	1	1					3	7	2		9	14		6			3	1		2	11	1		1	1	2	2			1	1	1		1		1	1	109	99	200

Towns in Middlesex Co.	Class IV.—Developmental Diseases. Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Spina Bifida.	Malformation.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Metritis.	Childbirth.	Total.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4.—Of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
Middletown	3	4	..	..	..	..	5	2	...	...	...	4	4	.....	3	9	9	18
Haddam	..	1	..	..	..	..	..	1	...	...	...	.....	2	.....	.....	..	3	3
Chatham	..	....	..	..	..	..	..	..	...	...	...	.....	.....	1	1	1	1	2
Chester	2	1	..	..	..	..	1	2	...	...	...	.....	.....	.....	1	1	3	4
Clinton	..	1	..	..	..	..	1	..	...	...	...	1	3	.....	.....	2	3	5
Cromwell	..	....	..	..	..	..	..	..	...	1	1	1	1	.....	.....	1	2	3
Durham	..	....	..	..	..	..	..	..	...	...	...	1	.....	.....	.....	1	..	1
East Haddam	..	2	..	..	..	..	2	..	...	1	1	1	1	1	.....	4	2	6
Essex	..	....	..	..	..	..	..	..	...	...	...	.....	1	.....	1	..	2	2
Killingworth	..	....	..	..	..	..	..	.	...	...	...	1	1	.....	.....	1	1	2
Middlesex	..	1	..	..	..	..	..	1	...	...	...	1	1	.....	.....	1	2	3
Old Saybrook	..	....	..	..	..	..	..	..	...	...	...	.....	1	.....	.....	..	1	1
Portland	2	....	..	..	..	..	1	1	...	1	1	1	3	.....	.....	2	5	7
Saybrook	2	....	..	..	..	..	..	2	...	...	...	1	1	.....	.....	1	3	4
Westbrook	..	....	..	..	..	..	..	..	...	...	...	.....	1	.....	.....	..	1	1
Totals	9	10	..	..	..	..	10	9	...	3	3	12	20	5	3	24	38	62

Towns in Middlesex Co.	Class V.—Violent Deaths. Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Accidents.	Railway Injury.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 2, 3, 4. Order 3—Homicide. M.	Order 3—Homicide. F.	Order 4—Suicide. M.	Order 4—Suicide. F.	Sudden. M.	Sudden. F.	Sudden, Cause unascertained. M.	Sudden, Cause unascertained. F.	Sex not stated.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.
Middletown	2	1	1	1	..	..	..	..	1	3	3	..	1	1	2	..	..	1	3	..	5	9	14	91	115	206
Haddam	..	..	..	..	..	1	..	..	..	1	..	..	..	1	..	..	..	..	..	..	2	..	2	12	14	26
Chatham	..	..	1	..	..	..	..	..	3	2	2	..	..	..	..	..	..	1	..	..	3	2	5	13	15	28
Chester	..	.	..	..	..	..	..	..	..	..	..	..	..	..	.	..	..	1	..	..	1	..	1	13	8	21
Clinton	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	4	..	..	5	5	10	14	24
Cromwell	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	2	1	..	3	1	4	13	17	30
Durham	..	..	..	..	1	..	..	.	..	1	..	..	..	..	..	..	..	..	..	..	1	..	1	8	7	15
East Haddam	..	..	..	..	..	1	..	..	..	1	..	..	..	1	..	1	..	1	.	..	4	..	4	28	18	46
Essex	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...	10	5	15
Killingworth	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...	4	5	9
Middlesex	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...	2	7	9
Old Saybrook	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	1	1	2	7	11	18
Portland	..	1	..	..	..	1	..	..	..	2	..	..	..	1	..	..	..	..	..	..	3	..	3	27	39	66
Saybrook	..	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	1	12	8	20
Westbrook	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	2	1	3	9	13	22
Totals	2	3	2	1	3	3	1	..	4	14	5	..	1	4	3	1	1	7	9	..	26	19	45	259	296	555

CLASS I.—ZYMOTIC DISEASES.

Towns in Tolland Co.	Order 1.—Miasmatic. Measles.	Scarlet Fever.	Diphtheria	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Eclampsia.	Carbuncle.	Pyaemia.	Septicaemia.	Influenza.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Order 2.—Enthetic. Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Order 3.—Dietic. Privation.	Purpura.	Alcoholism.	Intemperance.	Total. M.	Total. F.	Total for Class I. Males.	Females.	Total.
Tolland																					1		1									1	1		1	1	2
Andover						1										1						1	1							1			1		2	1	3
Bolton				1		1																1	1												1	1	2
Columbia			2	1												1						4													4		4
Coventry																1							1													1	1
Ellington						1									1								2													2	2
Hebron													1	1									2													2	2
Mansfield																1						1													1		1
Somers						1																	1													1	1
Stafford			2			1										1						2	2												2	2	4
Union						1																	1													1	1
Vernon			1	3	3	7									3	6				1	2	17	9						1			1	1	1	18	10	28
Willington						2								1	1	1						3	2												3	2	5
Totals			5	5	3	15							1	2	5	12				1	3	29	23						1	1		2	3	1	32	24	56

Towns in Tolland Co.	CLASS II.—CONSTITUTIONAL DISEASES.														
	Order 1.—Diathetic.				Order 2.—Tubercular.								Total for Class II.		
	Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Scrofula.	Marasmus.	Phthisis.	Hydrocephalus.	Peritonitis.	Meningitis.	Total. M.	Total. F.	Males.	Females.	Total.
Tolland	....	1	..	..	1	..	1	2	..	..	..	1	2	1	3	4
Andover	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bolton	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Columbia	....	..	..	..	..	..	..	3	..	..	..	1	2	1	2	3
Coventry	....	..	..	..	..	..	..	6	..	..	..	1	5	1	5	6
Ellington	....	2	..	..	2	..	..	1	..	..	..	..	1	..	3	3
Hebron	....	1	..	..	1	..	..	1	..	..	..	1	..	1	1	2
Mansfield	2	..	..	1	1	..	..	5	..	..	..	4	1	5	2	7
Somers	1	..	..	1	..	..	..	..	..	..	..	..	..	1	..	1
Stafford	1	1	..	..	2	..	..	4	..	..	..	1	3	1	5	6
Union	....	..	..	..	..	..	..	2	..	..	..	1	1	1	1	2
Vernon	2	2	1	2	3	..	1	17	..	..	..	6	12	8	15	23
Willington	....	1	..	..	1	..	..	5	..	..	..	1	4	1	5	6
Totals	6	8	1	4	11	..	2	46	..	..	..	17	31	·21	42	63

Towns in Tolland Co.	CLASS III.—LOCAL DISEASES.																									
	Order 1.—Nervous System.												Order 2.—Organs of Circulation.						Order 3.—Respiratory System.							
	Apoplexy.	Paralysis.	Insanity.	Chorea.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total. M.	Total. F.	Pericarditis.	Aneurism.	Heart Disease.	Angina.	Total. M.	Total. F.	Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
Tolland	1	..	..	..	..	..	1	..	..		2	..	..	..	3	..	2	1	..	..	..	..	..	..	..	..
Andover	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bolton	3	..	..	..	..	..	..	..	..	..	2	1	..	..	1	..	1	..	..	..	..	..	..	1	..	1
Columbia	..	..	..	..	..	..	..	..	1	..	1	..	..	..	2	..	1	1	..	..	..	1	..	..	1	..
Coventry	2	..	..	..	..	..	1	1	1	..	4	1	..	..	2	..	2	..	..	1	..	3	..	1	3	2
Ellington	..	..	..	..	..	..	1	..	..	..	1	..	..	..	2	..	1	1	..	..	..	1	..	..	1	..
Hebron	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..
Mansfield	2	3	..	..	..	..	..	..	..	..	3	2	..	..	..	..	..	..	..	..	..	..	..	1	..	1
Somers	2	..	..	..	..	..	..	2	..	..	2	2	..	..	2	..	2	..	..	..	..	3	..	..	..	3
Stafford	..	1	..	..	..	1	4	..	3	1	6	4	..	..	5	..	3	2	..	..	..	3	..	2	2	3
Union	1	..	..	..	..	..	..	..	..	..	..	1	..	..	2	..	1	1	..	..	..	..	..	..	..	..
Vernon	1	2	..	..	1	..	3	3	..	..	5	5	..	..	3	..	3	1	..	1	1	8	1	1	8	4
Willington	2	..	..	..	..	..	..	..	..	..	1	1	..	..	1	..	1	..	..	..	..	1	..	..	1	..
Totals	14	6	..	..	1	1	10	6	5	1	27	17	..	..	23	1	18	7	..	2	1	20	1	6	16	14

CLASS III. — LOCAL DISEASES — Concluded.

Towns in Tolland Co.	Order 4.—Digestive Organs.															Order 5.—Urinary Organs.										Order 6.—Generative Organs.				Order 7.—Organs of Locomotion.					Order 8.—Integumentary System.						Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Intussusception.	Fistula.	Strict. Œsoph.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Nephritis.	Bright's Disease.	Diabetes.	Gravel.	Cystitis.	Kidney Disease.	Uræmia.	Prostatitis.	Total. M.	Total. F.	Ovarian Dropsy.	Ovarian Tumor.	Disease of Uterus.	Total.	Joint Diseases.	Caries.	Necrosis.	Total. M.	Total. F.	Phlegmon.	Ulcer.	Tumor.	Skin Diseases.	Total. M.	Total. F.	Males.	Females.	Total.
Tolland									1			1		2			1	1						1	1																7	2	9
Andover																																											
Bolton																																									3	2	5
Columbia																					1			1			1		1												4	2	6
Coventry	1								1					1	1																										10	4	14
Ellington																																									3	1	4
Hebron						1									1				1					1																	2	1	3
Mansfield																	1							1																	4	3	7
Somers		1												1														1	1												5	6	11
Stafford												1			1		2							1	1			1	1												12	12	24
Union																																									1	2	3
Vernon		1						1			1	1		3	1		1							1																	20	11	31
Willington		1	1	1										2	1																										5	2	7
Totals	1	3	1	1		1		1	2		1	3		9	5		5	1	1		1			6	2		1	2	3												76	48	124

Towns in Tolland Co.	Class IV.—Developmental Diseases. Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Spina Bifida.	Malformation.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Metritis.	Childbirth.	Total.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4.—Of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
Tolland	1	...	..	..	..	..	1	..	...	1	1	2	1	...	...	3	2	5
Andover	1	...	..	..	..	..	..	1	...	1	1	1	1	...	...	1	3	4
Bolton	..	1	..	..	..	..	1	..	...	...	...	...	...	...	...	1	...	1
Columbia	..	...	..	..	..	..	..	..	...	...	...	...	...	...	...	...	...	...
Coventry	..	...	..	..	..	..	..	..	...	...	...	1	1	...	...	1	1	2
Ellington	..	...	..	..	..	..	..	..	...	...	...	...	1	...	...	...	1	1
Hebron	..	1	..	..	..	..	1	..	...	...	...	...	...	...	1	1	1	2
Mansfield	..	...	..	..	..	..	..	..	...	...	...	1	2	1	...	2	2	4
Somers	..	...	..	..	..	..	..	..	...	...	...	...	...	...	...	...	...	...
Stafford	..	1	..	..	..	..	1	..	...	...	...	2	...	...	...	3	...	3
Union	..	...	..	..	..	..	..	..	...	...	...	...	...	...	...	...	...	...
Vernon	6	6	1	1	..	1	7	8	...	1	1	...	3	...	...	7	12	19
Willington	..	...	..	..	..	..	..	..	...	...	...	2	...	...	...	2	...	2
Totals	8	9	1	1	..	1	11	9	...	3	3	9	9	1	1	21	22	43

Towns in Tolland Co.	Class V.—Violent Deaths. Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Accidents.	Railway Injury.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 2, 3, 4. Order 3—Homicide. M.	Homicide. F.	Order 4—Suicide. M.	Suicide. F.	Sudden. M.	Sudden. F.	Sudden Cause, unascertained. M.	Sudden Cause, unascertained. F.	Sex not stated.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.
Tolland	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	1	1	..	2	1	3	14	9	23
Andover	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	4	7
Bolton	..	..	1	..	..	1	..	..	..	1	1	..	..	..	..	..	..	..	..	..	1	1	2	6	4	10
Columbia	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	.	2	2	4	11	6	17
Coventry	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	.	1	1	2	13	12	25
Ellington	..	..	..	1	..	1	..	..	..	1	1	..	..	..	1	..	..	..	..	..	1	2	3	4	9	13
Hebron	..	..	..	..	..	1	..	..	1	2	..	..	..	..	..	..	..	..	1	..	2	1	3	6	6	12
Mansfield	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	...	2	3	12	10	22
Somers	..	..	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	1	8	6	14
Stafford	..	..	1	..	..	1	1	..	..	3	..	..	..	1	..	..	..	..	..	1	4	..	5	23	19	42
Union	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	4	6
Vernon	..	1	..	..	..	..	..	..	1	2	..	..	..	1	..	..	..	1	..	..	4	..	4	57	48	105
Willington	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	1	..	1	12	9	21
Totals	..	1	2	1	1	5	1	..	2	11	2	..	..	2	1	..	..	6	7	2	19	10	31	171	146	317

Recapitulation of Table 2.

CAUSES OF DEATH.	Hartford Co.	New Haven Co.	New London Co.	Fairfield Co.	Windham Co.	Litchfield Co.	Middlesex Co.	Tolland Co.	TOTAL.		PER CENT. TO TOTAL MORTALITY.	
									1878.	1877.	1878.	1877.
ZYMOTIC DISEASES.												
Order 1, Miasmatic	416	638	258	325	152	137	129	52	2107	2321	22.51	25.49
" 2, Enthetic	9	4	1	1	...	1	...	4	20	18	.22	.19
" 3, Dietic	7	8	7	6	5	1	1	...	35	41	.37	.46
Total, Class I	432	650	266	332	157	139	130	56	2162	2380	23.10	26.14
CONSTITUTIONAL DISEASES.												
Order 1, Diathetic	72	110	56	69	33	33	31	15	419	394	4.49	4.34
" 2, Tubercular	311	396	233	194	120	91	87	48	1480	1551	15.90	17.03
Total, Class II	383	506	289	263	153	124	118	63	1899	1945	20.39	21.37
LOCAL DISEASES.												
Order 1, Nervous System	216	390	160	180	63	84	87	44	1224	1177	13.09	12.75
" 2, Organs of Circulation	72	113	64	81	35	28	37	25	455	429	4.87	4.92
" 3, Organs of Respiration	145	185	76	120	46	49	35	30	686	782	7.34	8.78
" 4, Organs of Digestion	51	101	38	62	31	23	23	14	343	390	3.67	4.24
" 5, Urinary Organs	54	59	24	27	14	15	12	8	213	187	2.28	2.05
" 6, Generative Organs	4	6	....	4	...	1	2	3	20	36	.22	.39
" 7, Organs of Locomotion	2	2	1	1	...	3	2	...	11	30	.12	.32
" 8, Integumentary System	9	5	2	2	...	3	2	...	23	52	.24	.54
Total, Class III	553	861	365	477	189	206	200	124	2975	3093	31.83	33.98
DEVELOPMENTAL DISEASES.												
Order 1, Of Children	60	221	69	77	54	20	19	20	540	552	5.77	6.07
" 2, Of Women	23	5	7	12	2	4	3	3	59	74	.64	.81
" 3, Of Old People	108	113	82	107	40	42	32	18	542	476	5.78	3.23
" 4, Of Nutrition	36	26	20	23	10	2	8	2	127	220	1.36	2.41
Total, Class IV	227	365	178	219	106	68	62	43	1268	1322	13.55	14.52
VIOLENT DEATHS.												
Order 1, Accident	78	109	43	49	13	29	19	13	353	283	3.76	3.10
" 3, Homicide	1	5	....	3	1	2	1	...	13	10	.13	.11
" 4, Suicide	8	17	7	11	3	2	7	3	58	52	.61	.57
Sudden, Cause unascertained	7	5	5	13	...	4	2	...	36	19	.37	.21
Cause not stated	211	44	117	89	65	31	16	15	588	592	6.27	......
Total, Class V	305	180	172	165	82	68	45	31	1048	956	11.13	......
Grand Total	1900	2562	1270	1456	687	605	555	317	9352	9696	100.00	100.00

TABLE 3.

CAUSES OF DEATH BY MONTHS, AGE, AND SEX.

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Unknown.	DISEASE.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Males.	Females.	Unknown.	Total.
			1		1				1	1	1		Abscess					1	1	1	1	1					2	3		5
7	3	2	6	4	9	6	5	2	3	12	6		Accident	8	5	9	4	7	4	4	9	4	9	2			49	16		65
1		1	2		5	1			4	4	2		Alcoholism					4	3	5	8						15	5		20
3		1			2	3	3						Aneurism							3	3	1	2				10	2		12
2			1										Angina Pectoris							1	1	1					2	1		3
24	23	26	24	16	21	22	21	18	20	30	22		Apoplexy					3	22	20	62	56	64	27	12	1	160	107		267
2		1			1	2			3	1	1		Ascites						1		4		3	2			7	3		10
	1	1	2	2	1		1	1	1				Asthma				2		2	1	2	1	1	1			4	6		10
	1				2								Arthritis							1		2					2	1		3
15	17	22	13	28	20	20	21	27	18	14	15		Brain, Disease of	43	54	17	13	11	23	16	14	17	21	2			125	106		231
7	2	17	8	13	2	4	5	3	4	16	2		Bronchitis	9	8	7		1	3	5	3	14	15	15	3		33	50		83
20	6	12	12	8	5	6	4	8	10	9	10		Bright's Disease		1	1	4	12	8	13	32	35	15	1			75	35		110
3	1	8	4	3	2	3		12	3	4	3		Burns and Scalds	2	16	4	4	4	4		6	3					23	20		43
18	19	20	15	21	22	18	28	21	30	14	19		Cancer		1	1		4	16	56	58	54	36	19			75	170		245
1	2	2								1	1		Carbuncle				1			1	2	1	1				2	4		6
				1		1		1					Calculus							1	1	1					3			3
3	5	4	3	6	5	6	2	2	5		6		Cerebro-Spinal Meningitis	4	7	13	6	14	3								25	22		47
5	6	5	7	5	6	3	4	7	4	5	6		Childbirth				10	20	20	12								62		62
		3	4	3	12	180	145	60	15				Cholera Infantum	326	96												234	188		422
		1					1						Chorea				2											2		2
136	98	111	123	142	102	99	102	92	100	116	95		Consumption	30	28	17	189	332	227	175	120	108	61	9			572	732	12	1316
	2			2	2	5	3	2					Colic	4	1	4				3			5							16
18	12	17	29	20	24	38	22	16	12	30	15		Convulsions	140	78	10	8	7	6	4							140	113		253
33	12	13	11	10	7	5	8	5	17	25	32		Croup	40	100	34	4										92	86		178
1	1	1	2		2				1		1		Cyanosis	9													6	3		9
	1	3	1	4	2	5		1	1				Cystitis					2	2	1	4	5	4				14	4		18
12	14	13	9	10	9	14	15	5	12	12	12		Debility and Atrophy	35	6	1		3	9	8	16	28	29	9			69	38		127

1	4	2	...	2	4	2	3	3	2	1	...	..	Diabetes	...	...	...	4	6	4	2	2	4	1	1	...	..	15	9	..	24
...	3	1	...	1	1	16	19	16	3	...	...	..	Diarrhœa	10	12	7	4	5	...	2	8	2	4	6	...	..	31	29	..	60
70	46	24	30	28	29	16	19	26	70	59	47	..	Diphtheria	31	183	187	43	12	4	4	...	..	...	...	...	..	232	222	10	464
10	18	14	21	11	7	10	6	16	10	18	18	..	Dropsy and Anæmia	6	7	4	3	3	7	22	26	32	32	16	1	..	76	83	..	159
4	2	1	3	4	4	12	10	6	...	2	2	..	Drowned	1	6	7	13	9	6	4	1	3	...	...	...	..	34	16	..	50
1	2	1	1	1	...	11	39	14	15	1	...	..	Dysentery	4	20	7	6	...	...	9	3	9	10	15	3	..	36	50	..	86
...	...	1	...	...	1	1	...	1	...	1	...	..	Embolism	...	...	...	...	2	1	...	2	...	...	...	...	..	3	2	..	5
5	1	3	...	4	5	1	9	2	3	5	7	..	Enteritis	7	14	4	2	5	4	3	3	3	...	...	...	..	25	20	..	45
1	1	1	4	2	5	1	...	...	2	2	1	..	Epilepsy	...	1	2	5	5	4	2	1	...	...	...	...	..	8	12	..	20
...	...	...	...	...	1	...	...	...	...	...	...	..	Epistaxis	...	...	...	...	1	...	...	...	...	...	...	...	..	...	1	..	1
8	3	5	6	5	4	3	2	2	8	5	5	..	Erysipelas	14	4	1	3	3	5	7	5	5	5	4	..	..	33	23	..	56
1	...	...	...	...	...	...	...	...	...	...	1	..	Exposure	...	...	...		...	...	...	...	...	1	1	...	..	...	...	..	2
5	2	2	3	1	3	2	10	10	9	6	1	..	Fever, Intermittent and Congestive	3	5	2	7	4	10	3	1	4	7	8	...	..	28	26	..	54
...	...	...	...	1	1	1	2	3	2	2	1	..	Fever, Remittent	...	1	2	2	..	1	2	...	2	3	...	...	..	5	8	..	13
24	13	18	17	16	11	9	27	47	28	23	20	7	Fever, Typhoid	7	16	15	37	86	27	17	19	15	13	8	...	..	140	114	6	260
4	1	6	3	4	6	7	15	12	7	9	4	..	Fever, Typho-Malarial	2	4	3	10	7	10	7	14	13	6	2	...	..	48	30	..	78
5	6	1	3	2	4	6	4	15	3	6	5	..	Fracture and Contusions	1	1	5	4	11	8	4	9	6	5	6	...	..	48	12	..	60
1	1	...	...	...	...	...	...	...	...	...	1	..	Frozen	...	..	1	...	1	...	...	...	...	1	...	...	..	3	...	..	3
4	3	3	5	10	4	2	6	5	...	2	2	..	Gastritis	6	2	...	1	4	2	4	3	9	10	5	...	..	22	24	..	46
9	...	...	...	3	1	...	...	...	...	...	...	..	Gangrene	...	...	...	...	...	...	...	...	1	1	1	1	..	4	...	..	4
41	39	34	35	35	30	32	32	16	42	41	33	14	Heart Disease	27	9	7	10	19	36	60	54	85	92	25	...	..	226	198	..	424
...	...	...	...	...	...	4	1	...	...	...	...	..	Heat, Sunstroke	...	...	1	2	...	1	...	1	...	...	...	...	..	4	1	..	5
6	...	1	2	3	2	3	7	...	...	1	5	..	Hemorrhage	6	...	...	5	4	6	4	2	1	2	...	...	..	14	16	..	30
3	...	1	...	...	...	...	4	3	...	1	3	..	Hepatitis	3	...	1	...	...	2	1	...	5	3	...	...	..	5	10	..	15
1	5	2	...	1	6	1	7	2	4	...	1	..	Hernia	...	1	...	1	5	2	6	9	6	...	...	...	..	18	12	..	30
...	...	2	1	1	1	2	1	2	...	1	1	..	Homicide	...	...	...	...	4	2	1	2	2	1	...	...	..	10	2	..	12
2	2	7	2	4	5	9	6	5	4	5	3	..	Hydrocephalus	26	21	6	1	...	...	...	...	...	...	...	...	..	35	19	..	54
2	1	1	...	...	...	...	...	...	1	1	1	..	Hydrophobia	...	...	...	1	...	3	2	1	...	...	...	...	..	6	1	..	7
2	4	4	2	2	1	2	5	5	8	4	1	..	Insanity	...	...	...	...	...	3	2	10	12	6	5	2	..	21	19	..	40
...	1	1	...	1	2	...	...	...	...	...	...	..	Intussusception	1	...	...	...	...	1	1	1	...	...	...	1	..	3	2	..	5
...	1	...	1	1	1	2	...	3	...	...	2	..	Jaundice	1	...	...	...	...	1	...	4	3	1	1	...	..	3	8	..	11
2	...	...	...	1	...	...	...	1	...	...	1	..	Joint Disease	..	1	1	1	1	...	...	...	...	1	...	...	..	2	3	..	5
1	4	2	2	...	4	8	...	1	4	6	3	..	Kidney Disease	...	...	...	2	2	4	9	6	4	6	2	...	..	23	12	..	35
1	...	1	1	2	4	...	...	4	2	...	...	..	Laryngitis	3	3	6	1	...	1	1	...	...	...	...	...	..	10	5	..	15
...	...	...	...	...	...	1	2	...	...	...	...	..	Lightning	...	...	1	...	1	...	...	1	...	...	...	...	..	3	...	..	3

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Unknown.	DISEASE.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Males.	Females.	Unknown.	Total.
7	7	8	8	1	4	5	7	6	4	5	4	..	Liver Disease	4	4	...	...	4	5	9	14	14	7	4	1	..	31	35	..	66
14	12	11	12	11	8	6	6	5	7	10	9	..	Lung Disease	29	11	4	3	8	5	8	8	12	12	1	...	..	53	58	..	111
...	...	...	1	...	...	...	...	...	...	...	...	..	Lupus	...	...	...	...	...	...	...	...	...	1	...	...	..	1	...	..	1
...	2	...	2	5	5	...	1	1	...	2	1	..	Malformation	16	3	...	...	...	...	...	...	...	...	...	...	..	15	4	..	19
1	1	...	3	3	9	2	1	...	...	...	...	..	Measles	4	9	2	2	2	...	...	...	1	...	...	...	..	12	8	..	20
3	2	1	...	4	1	1	1	1	1	1	...	..	Mortification	...	...	...	...	...	...	...	1	5	4	3	3	.	10	6	..	16
9	9	10	20	13	11	18	15	8	19	9	2	..	Meningitis	37	49	16	15	7	6	5	4	1	3	...	...	..	74	69	..	143
...	...	...	1	...	...	...	...	2	...	...	...	..	Necrosis	...	...	...	1	...	1	1	...	...	...	...	...	..	3	...	..	3
...	1	...	...	1	1	...	...	...	...	2	1	..	Nephritis	...	...	...	...	...	1	1	1	2	1	...	...	..	4	2	..	6
40	39	21	30	30	20	15	20	21	10	18	28	..	Not Stated	53	32	31	31	58	27	24	226	...	...	...	...	..	162	120	..	282
60	49	50	49	53	29	43	46	69	52	40	66	..	Old Age	...	...	...	...	...	...	...	...	18	186	283	110	9	238	368	..	606
...	...	2	2	...	...	...	...	...	1	...	1	..	Ovarian Dropsy	...	...	...	...	...	1	1	2	1	1	...	...	..	...	6	..	6
...	2	1	...	...	1	...	1	2	...	...	...	..	Ovarian Tumor	...	...	...	...	2	1	3	1	...	...	...	...	..	...	7	..	7
18	26	26	24	18	25	20	22	16	12	20	25	..	Paralysis	1	1	1	1	...	10	19	25	50	84	48	12	..	115	137	..	252
1	1	2	1	2	...	4	1	2	...	4	...	..	Pericarditis	...	...	3	1	1	1	4	6	1	1	...	...	..	14	4	..	18
11	9	4	4	...	4	7	4	3	6	5	1	..	Peritonitis	2	2	6	12	8	9	6	1	6	4	1	1	..	22	36	..	58
2	1	1	2	...	...	...	...	...	...	3	2	..	Pleurisy	...	1	...	...	...	4	2	2	2	...	...	...	..	6	5	..	11
60	65	75	58	32	27	10	20	13	18	34	46	..	Pneumonia	44	55	16	20	14	45	40	28	65	58	65	6	2	228	230	..	458
...	...	2	...	...	...	4	5	...	6	1	...	..	Poison	...	2	...	...	8	5	1	1	1	...	...	...	..	11	7	..	18
32	20	19	25	30	25	31	32	16	31	8	21	..	Premature Birth and Debility	290	...	...	...	...	...	...	...	...	...	...	...	..	185	105	..	290
...	1	...	...	...	1	1	...	...	...	...	...	..	Pyaemia and Septicaemia	...	...	...	...	2	1	...	...	...	...	...	...	..	2	1	..	3
...	...	...	1	...	...	...	...	1	...	2	1	..	Privation	...	...	1	1	...	...	...	...	...	1	2	...	..	4	1	..	5
...	...	...	...	1	1	2	...	...	...	1	...	..	Prostate, Disease of	...	...	...	...	...	...	...	...	1	2	2	...	..	5	...	..	5
...	...	1	...	...	1	...	3	...	...	...	...	..	Puerperal Convulsions	...	...	...	...	2	3	...	...	...	...	...	...	..	...	5	..	5
...	...	2	...	...	1	...	3	...	...	...	...	..	Purpura	...	...	1	1	...	1	...	...	1	1	...	1	..	4	2	..	6
12	...	4	2	2	1	1	..	2	2	3	8	..	Railroad Accidents	...	...	1	6	11	8	4	3	4	..	...	...	..	29	8	..	37
1	4	3	4	5	3	2	5	6	6	2	2	..	Rheumatism	...	3	2	3	5	1	4	10	8	5	2	...	..	17	26	..	43

30	29	22	25	20	22	19	16	5	9	5	13		Scarlatina	15	99	75	24	2									110	105		215
1	3	1	4	5		4	7	1	4		1		Scrofula		8	7	6			2	1	4		1	2		9	22		31
	1	1											Skin Diseases		2													2		2
						2				2			Spina Bifida	4													1	3		4
		1	1										Spine Diseases			2											1	1		2
1										1			Spleen Diseases						1	1							2			2
8	6	1	4	3	4	5	6	3	5	1	2		Stomach Disease	3	3	2	4	7	6	5	3	3	4	8			26	22		48
1	2					1		4	1		2		Stricture and Obstruction Intestine	2	1	1	1					2	1	3			7	4		11
						1							Stricture Oesophagus								1						1			1
29	20	31	28	27	21	27	18	20	28	27	24		Stillborn	300													180	120		300
7	2	2	1	1	5	5	1	5	4	2	1		Suddenly	1	2		4	4	1	6	4	7	1	6			27	9		36
	3	2	1		2	1	1		1	2			Suffocation	1	5	4		1	1		1						5	8		13
6	4	5	1	6	3	4	4	6	12	3	1		Suicide				2	3	5	7	14	8	11	4	1		36	19		55
		2	3			1		1			1		Syphilis	3	4		1										6	2		8
4	3	4	5	4	3	4	11	10	7	2	5		Tabes Mesenterica	38	12	1	1	4	4		1		1				33	29		62
1	2	1			1	1	5	4					Teething	10	5												10	5		15
1	1			1	1	1	3		1	1	2		Tetanus	4	1	1	1	1	1		3						8	4		12
2	1	2	1	1	1			1	4	1			Tumor			1	1		1	2	3	2	2	2			8	6		14
		1			2	1			1		1		Ulcer								1	4		1			4	2		6
3	2		2	1		1		2					Ulcer Intestines			1	1	1	3		1		2	1	1		7	4		11
		1		1			2	3	3	1	1		Uraemia				3	2	2	2	3	13					8	4		12
	1		1	1	2		1	2					Uterus, Disease of					2	2	3	1							8		8
13	7	16	2		4	1	9	3	4	7	2		Whooping Cough	35	28	5											25	43		68
							2						Worms		2												1	1		2
8	1	3	1	3	1	2	1	2	2		2		Wounds	1	3	4	4	6	4	1	2			1			21	5		26
							29	1					Killed by Tornado	2	1	5	8	3	3	5	3						15	15		30

TABLE 4.

DEATHS IN TOWNS. ALPHABETICAL ARRANGEMENT, DISTINGUISHED BY NATIONALITY, AGE, AND SEX.

NAME OF TOWN.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Unknown.	Birthplace, Connecticut.	Other States.	Birthplace, Ireland.	Birthplace, Germany.	Birthplace, England.	Other Foreign Countries.	Unknown.	Males.	Females.	Unknown.	Total.
Andover	2	1	..	..	..	1	..	..	..	..	3	..	..	..	6	..	1	..	..	..	..	3	4	..	7
Ashford	2	1	..	1	1	..	2	..	3	4	..	1	..	..	11	1	..	..	1	2	..	10	5	..	15
Avon	2	..	..	2	2	..	..	..	..	5	2	1	..	..	12	..	1	1	..	..	..	6	8	..	14
Barkhamsted	1	1	1	2	..	1	..	..	1	2	3	1	..	..	11	1	..	..	1	..	..	7	6	..	13
Beacon Falls	..	2	..	..	1	1	..	..	1	..	1	..	..	..	3	3	..	..	..	..	..	..	6	..	6
Berlin	7	1	..	1	4	1	3	..	1	4	5	..	..	..	25	1	1	..	..	..	..	18	9	..	27
Bethany	1	..	..	..	..	..	..	..	1	2	..	1	..	..	5	..	..	..	..	..	..	4	1	..	5
Bethel	8	2	..	3	6	4	2	1	1	4	8	..	..	..	28	5	4	..	..	2	..	16	23	..	39
Bethlehem	2	..	..	..	..	2	..	1	1	..	..	..	..	..	6	..	..	..	..	..	..	5	1	..	6
Bloomfield	..	..	..	1	1	1	1	1	4	4	2	1	..	..	8	..	1	..	1	6	..	7	9	..	16
Bolton	1	2	..	..	..	1	1	..	2	2	1	..	..	..	7	2	1	..	..	..	..	6	4	..	10
Bozrah	3	12	1	..	..	..	1	..	..	1	..	..	..	..	4	..	1	..	1	..	..	2	4	..	6
Branford	12	5	8	2	6	3	4	4	2	2	1	..	..	..	41	3	2	..	1	2		22	27		49
Bridgeport	94	114	50	22	19	22	20	14	24	16	9	5	..		260	60	35	8	5	31	..	208	185	6	399
Bridgewater	..	..	..	..	..	..	2	..	..	..	4	..	..	..	6	..	..	..	..	..	..	3	3	..	6
Bristol	7	3	1	4	5	5	10	3	10	7	3	6	..	..	51	3	7	..	3	..	..	33	31	..	64
Brookfield	1	..	..	4	..	1	2	..	2	3	1	..	..	..	14	..	..	..	..	..	..	7	7	..	14
Brooklyn	6	5	1	1	3	3	1	1	3	5	2	..	..	..	21	5	1	..	..	4	..	16	15	..	31
Burlington	..	..	..	..	..	3	1	2	6	4	4	1			17	1	1	..	2	..	..	14	7	..	21
Canaan	1	..	1	..	2	1	..	1	2	..	..	1	..	..	7	1	1	..	..	..	..	4	5	..	9
Canterbury	2	1	..	1	2	..	..	2	1	4	4	1	..	..	17	..	1	..	..	..	..	8	10	..	18
Canton	6	8	..	1	..	2	2	3	3	3	5	..	..	..	24	4	2	..	..	3	..	19	14	..	33
Chaplin	1	..	..	..	1	..	..	..	1	1	2	..	..	..	6	..	..	..	..	..	..	3	3	..	6
Chatham	1	..	2	..	3	..	4	2	4	9	3	..	..	..	27	1	..	..	..	..	..	13	15	..	28
Cheshire	1	1	1	2	6	3	..	5	5	5	6	..	..	..	26	3	3	..	..	3		16	19	..	35
Chester	5	1	..	1	3	..	2	1	4	2	1	1	..	..	15	2	3	..	1	..	..	13	8	..	21
Clinton	3	..	3	..	..	1	2	3	5	3	4	..	..	..	19	2	..	..	..	3	..	10	14	..	24
Colchester	..	8	18	4	9	1	4	3	4	8	4	1	..	..	48	..	5	1	..	10	..	34	30	..	64
Colebrook	..	..	..	..	..	2	1	1	1	1	3	..	..	..	5	1	1	..	..	2	..	4	5	..	9
Columbia	..	1	2	1	2	3	..	..	1	5	2	..	..	..	13	1	2	1	..	..	..	11	6	..	17
Cornwall	3	1	..	..	..	1	..	1	3	4	2	..	..	..	15	..	..	..	..	..	..	7	8	..	15
Coventry	3	1	..	1	3	..	3	3	2	6	3	..	..	..	14	2	5	..	..	4	..	13	12	..	25
Cromwell	1	7	2	..	2	2	3	1	5	3	4	..	..	..	19	2	3	2	..	4	..	13	17	..	30
Danbury	31	16	5	5	6	10	15	6	6	16	11	4	..	..	71	25	9	1	..	25	..	70	57	4	131
Darien	4	2	..	1	4	..	3	2	2	1	5	1	..	..	16	9	..	..	..	..	..	14	11	..	25
Derby	20	52	26	10	18	13	8	6	12	6	6	1	..	..	130	16	19	3	5	5	..	86	92	..	178
Durham	..	1	..	3	..	..	..	..	3	6	2	..	..	..	10	..	..	..	..	5	..	8	7	..	15
Eastford	1	2	3	..	3	..	2	..	6	4	1	..	1	..	18	4	1	..	..	..	..	12	11	..	23
East Granby	3	..	1	2	2	1	1	..	2	3	1	..	..	..	10	3	3	..	..	..	..	7	9	..	16
East Haddam	3	4	1	..	4	1	2	3	5	9	8	5	1	..	41	3	1	..	1	..	..	28	18	..	46
East Hartford	11	3	2	1	2	4	7	5	7	5	4	4	..	..	44	1	6	1	..	3	..	28	27	..	55
East Haven	9	..	..	..	2	..	2	2	3	8	3	..	..	..	23	..	..	..	4	2	..	18	11	..	29
East Lyme	7	1	1	..	1	5	..	3	4	5	2	2	..	..	18	1	..	..	..	12	..	13	16	2	31
Easton	2	..	..	..	..	..	1	1	2	2	3	1	..	..	12	..	..	..	..	..	..	4	8	..	12
East Windsor	11	..	2	2	2	2	..	..	2	3	5	..	..	..	23	1	1	1	..	3	..	15	14	..	29

TABLE 4.—CONTINUED.

NAME OF TOWN.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Unknown.	Birthplace, Connecticut.	Other States.	Birthplace, Ireland.	Birthplace, Germany.	Birthplace, England.	Other Foreign Countries.	Unknown.	Males.	Females.	Unknown.	Total.
Ellington	1	..	..	1	..	..	4	2	2	2	..	1	..	..	9	1	3	..	..	..	..	4	9	..	13
Enfield	19	15	12	17	14	15	8	5	6	8	4	1	1	..	87	5	21	..	4	8	..	43	81	1	125
Essex	2	2	..	2	1	1	1	2	1	1	1	1	..	..	13	2	..	..	..	..	..	10	5	..	15
Fairfield	1	4	2	1	..	4	2	5	6	9	6	1	..	..	35	2	3	..	1	..	..	13	28	..	41
Farmington	5	5	..	3	4	4	4	6	5	5	2	2	..	..	31	6	4	..	1	3	..	19	26	..	45
Franklin	..	2	1	..	..	..	2	1	2	1	..	..	..	..	8	1	..	..	..	..	..	7	2	..	9
Glastonbury	3	2	..	..	..	4	3	5	6	14	6	1	..	..	32	4	1	1	1	5	..	21	23	..	44
Goshen	2	1	..	1	1	..	..	..	1	3	2	..	..	..	9	2	..	..	..	..	..	6	4	1	11
Granby	2	1	6	1	4	3	4	5	4	1	1	..	..	..	27	4	1	..	..	..	..	15	17	..	32
Greenwich	8	4	5	1	5	4	7	4	8	15	10	5	..	..	49	18	4	3	..	2	..	42	34	..	76
Griswold	7	1	2	3	2	..	2	2	2	3	4	..	..	..	20	5	3	1	..	..	..	18	11	..	29
Groton	8	6	..	3	4	3	5	6	6	14	5	2	..	..	50	8	..	2	1	..	..	37	23	1	61
Guilford	4	5	..	4	3	2	..	3	5	5	7	..	..	..	34	3	..	..	..	1	..	18	20	..	38
Haddam	3	1	2	2	1	4	..	4	2	5	2	..	..	..	26	..	..	..	..	..	..	12	14	..	26
Hamden	7	3	2	1	..	4	4	2	7	12	3	..	..	..	27	3	6	..	2	7	..	22	22	1	45
Hampton	..	..	1	3	..	2	1	1	1	1	4	1	..	..	9	5	1	..	..	..	..	6	9	..	15
Hartford	147	80	25	42	75	93	77	41	44	59	28	11	..	34	450	95	140	15	16	10	30	384	366	6	756
Hartland	..	..	..	..	2	1	..	..	1	2	..	..	..	..	*6	..	..	..	..	..	..	3	3	..	6
Harwinton	1	3	..	..	1	2	..	..	..	7	1	..	..	..	14	..	1	..	..	..	..	6	9	..	15
Hebron	1	..	..	..	..	..	..	3	1	3	3	1	..	..	12	..	..	..	..	..	..	6	6	..	12
Huntington	3	3	..	2	2	4	..	1	8	5	2	1	..	..	24	4	2	..	..	..	1	15	16	..	31
Kent	..	..	1	..	..	2	2	1	3	2	2	..	..	..	11	1	..	..	1	..	..	7	6	..	13
Killingly	42	5	4	5	7	8	2	11	5	6	10	1	..	..	75	14	8	..	3	6	..	69	37	..	106
Killingworth	1	..	..	..	..	1	..	..	2	2	2	1	..	..	8	1	..	..	..	..	..	4	5	..	9
Lebanon	..	..	2	2	4	1	1	2	2	4	..	2	..	1	14	7	..	..	..	..	..	8	13	..	21
Ledyard	4	1	..	1	1	2	1	1	3	6	5	..	..	..	25	..	..	..	..	..	..	9	16	..	25
Lisbon	3	..	1	..	2	..	1	..	4	3	..	..	..	..	11	1	..	2	..	..	..	6	8	..	14
Litchfield	8	4	..	2	4	4	1	2	4	3	5	2	..	..	24	6	2	..	1	..	6	16	23	..	39
Lyme	3	1	2	1	1	..	1	2	..	5	1	..	..	..	16	1	..	..	..	..	..	11	6	..	17
Madison	1	..	2	2	5	5	1	2	1	6	1	..	..	..	21	4	..	1	..	..	..	12	14	..	26
Manchester	12	6	1	2	5	9	4	6	5	11	3	1	..	..	*44	3	12	2	4	..	..	38	27	..	65
Mansfield	1	1	..	1	..	2	..	2	1	7	6	1	..	..	19	1	1	..	1	..	..	12	9	1	22
Marlborough	1	..	..	1	..	..	..	2	1	..	2	..	..	..	6	..	1	..	..	..	..	3	4	..	7
Meriden	93	79	33	18	14	38	18	13	16	11	5	4	1	..	275	5	50	6	15	3	10	189	172	..	361
Middlebury	1	..	..	2	..	1	1	1	3	1	1	1	..	..	11	..	..	..	..	..	1	6	6	..	12
Middlefield	..	2	1	..	..	..	1	..	1	1	2	1	..	..	8	..	1	..	..	..	..	2	7	..	9
Middletown	29	21	6	13	17	15	18	31	17	22	13	4	..	..	141	15	25	7	7	6	5	91	115	..	206
Milford	8	5	11	3	5	4	6	6	7	6	8	..	..	..	57	3	4	1	..	..	4	31	38	..	69
Monroe	..	..	..	..	..	..	2	..	1	1	1	1	..	..	5	1	..	..	..	..	..	3	3	..	6
Montville	2	..	..	1	2	..	..	1	..	2	5	1	1	..	14	..	1	..	..	..	..	5	10	..	15
Morris	1	1	1	..	..	1	..	..	2	4	3	..	..	..	13	..	..	..	..	..	..	7	6	..	13
Naugatuck	22	8	1	3	7	..	2	..	3	5	7	1	..	..	45	..	8	3	3	..	..	30	29	..	59
New Britain	40	35	14	11	16	12	15	13	17	7	6	7	..	..	93	23	12	7	4	3	53	97	96	2	195
New Canaan	3	2	1	4	2	2	4	3	8	8	..	..	..	..	23	9	..	..	..	2	1	17	18	..	35
New Fairfield	..	2	..	..	2	..	..	..	6	2	..	..	..	..	11	1	..	..	..	..	..	6	5	1	12
New Hartford	6	10	2	5	6	3	4	..	6	5	3	..	..	..	29	3	7	2	1	1	7	29	21	..	50
New Haven	288	183	60	52	98	95	85	83	88	77	37	7	..	..	750	137	180	15	45	26	..	585	568	..	1153

*Misprint on page 13.

TABLE 4.—Continued.

NAME OF TOWN.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Unknown.	Birthplace, Connecticut.	Other States.	Birthplace, Ireland.	Birthplace, Germany.	Birthplace, England.	Other Foreign Countries.	Unknown.	Males.	Females.	Unknown.	Total.
Newington	5	1	1	..	1	1	1	..	4	1	1	2	..	..	15	1	2	..	..	..	..	8	9	1	18
New London	46	23	11	17	16	19	14	14	19	20	5	7	..	..	161	18	17	4	2	9	..	92	100	19	211
New Milford	6	..	1	2	6	4	3	3	1	3	10	2	..	..	23	2	1	..	..	15	..	19	22	..	41
Newtown	5	6	2	..	1	4	5	4	1	2	6	3	..	..	32	7	..	..	..	..	..	21	18	.	39
Norfolk	3	..	1	2	1	..	3	2	3	2	2	1	..	..	13	3	3	..	..	..	1	6	13	1	20
North Branford	..	..	..	1	..	2	1	1	1	1	3	..	..	..	9	..	..	1	..	..	..	6	4	..	10
North Caanan	2	3	3	1	1	3	.	2	2	4	1	..	..	..	19	3	..	..	..	..	..	13	9	..	22
North Haven	6	..	..	..	1	4	..	1	1	6	2	..	..	..	20	..	..	..	1	..	..	7	14	..	21
North Stonington	3	8	12	1	4	3	1	..	2	8	5	1	..	..	45	2	.	..	..	1	..	26	22	..	48
Norwalk	46	19	7	10	24	23	16	19	24	14	12	3	..	..	136	47	20	6	2	6	..	121	95	1	217
Norwich	88	74	30	42	39	39	33	34	35	50	27	5	1	..	365	24	81	3	7	15	2	265	230	2	497
Old Lyme	3	..	..	..	..	2	..	3	..	4	1	..	..	..	10	3	..	..	..	..	..	8	5	..	13
Old Saybrook	2	2	..	..	1	1	2	1	2	2	5	..	..	..	14	3	..	..	1	..	..	7	11	..	18
Orange	10	4	1	2	2	4	2	3	5	7	4	..	..	..	32	6	1	2	3	..	..	19	25	..	44
Oxford	1	1	2	1	..	1	1	4	1	4	2	..	..	..	16	..	2	..	..	..	..	10	8	..	18
Plainfield	7	4	..	1	7	3	3	2	2	3	6	..	..	..	23	15	..	..	..	..	..	23	15	..	38
Plainville	3	2	2	1	..	1	..	1	2	1	1	..	..	..	9	2	1	1	1	..	..	7	7	..	14
Plymouth	4	1	2	2	1	1	..	..	4	1	..	..	..	..	11	1	2	1	1	..	..	8	8	..	16
Pomfret	7	1	..	..	3	5	1	1	4	6	..	..	..	..	21	7	..	..	..	..	..	19	9	..	28
Portland	15	3	1	6	9	1	4	4	8	9	4	2	..	..	46	..	13	..	4	3	..	27	39	..	66
Preston	4	2	1	4	6	3	2	6	5	5	1	1	..	..	..	..	..	..	..	..	40	19	21	..	40
Prospect	..	..	..	..	1	2	1	1	2	..	..	..	..	..	6	..	1	..	..	..	..	5	2	..	7
Putnam	28	16	15	9	9	11	9	9	6	7	2	..	..	..	62	21	6	23	9	..	..	55	63	3	121
Redding	2	2	..	1	..	1	1	2	2	3	2	1	..	..	15	1	1	..	..	..	..	8	9	..	17
Ridgefield	4	2	..	1	1	5	5	..	3	3	5	2	..	..	25	5	1	1	..	..	..	17	14	1	32
Rocky Hill	1	..	..	1	..	3	2	..	3	1	2	..	..	..	9	1	2	..	..	1	..	3	10	..	13
Roxbury	1	..	..	..	..	..	1	2	4	2	2	1	..	..	10	..	3	..	..	..	..	5	8	..	13
Salem	..	..	..	..	1	..	..	1	..	2	3	..	..	..	7	..	..	..	..	..	..	4	3	..	7
Salisbury	4	1	3	1	4	1	6	1	3	3	7	1	..	..	23	10	1	1	..	..	1	19	15	1	35
Saybrook	5	2	..	..	1	..	..	2	1	2	5	2	..	..	17	3	..	..	..	..	..	12	8	..	20
Scotland	1	2	..	1	..	1	1	..	2	1	..	..	..	..	9	..	..	..	..	..	..	3	6	..	9
Seymour	9	3	..	5	4	4	3	2	3	3	1	2	.	..	30	2	2	1	1	..	..	19	18	..	37
Sharon	4	2	..	3	1	1	1	3	2	6	2	..	..	..	14	5	2	..	..	4	..	15	10	..	25
Sherman	3	1	..	..	..	1	2	2	2	3	..	..	..	..	13	1	..	..	..	..	..	9	5	..	14
Simsbury	3	8	1	4	4	2	2	2	3	6	3	..	..	*	33	7	7	3	..	..	..	28	22	..	50
Somers	..	..	2	1	1	1	..	1	1	6	1	..	..	..	11	3	..	..	..	..	..	8	6	..	14
Southbury	2	3	1	1	..	..	2	1	1	2	3	1	..	..	15	2	..	..	..	..	..	12	5	..	17
Southington	14	17	6	3	9	5	5	6	7	8	2	..	..	..	65	5	10	1	..	..	1	48	34	..	82
South Windsor	4	1	3	..	2	..	1	4	3	4	1	..	..	..	20	1	1	..	..	..	1	9	12	2	23
Sprague	8	14	2	7	3	2	3	2	5	3	2	..	..	..	28	5	6	1	1	9	1	29	22	..	51
Stafford	8	4	..	3	6	5	1	2	4	4	5	..	..	..	24	6	6	..	1	5	..	22	19	1	42
Stamford	35	18	10	10	15	17	21	16	10	16	10	2	..	..	121	25	20	2	2	10	..	99	80	1	180
Sterling	3	1	..	..	1	..	..	1	1	..	..	..	..	..	6	1	..	..	..	..	..	4	3	..	7
Stonington	14	9	4	7	7	3	8	3	12	14	6	2	..	..	46	11	12	1	1	18	..	42	47	..	89
Stratford	2	1	..	3	3	1	1	2	4	1	4	1	..	..	14	8	1	..	..	..	..	10	13	..	23
Suffield	3	2	1	4	4	1	2	2	5	5	3	..	..	..	20	3	4	1	1	3	..	20	12	..	32
Thomaston	4	5	4	3	4	4	2	2	1	1	..	..	..	..	25	2	1	1	1	..	..	16	14	..	30

*Twelve killed at Tariffville disaster, ages not given.

TABLE 4.—CONTINUED.

NAME OF TOWN.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Unknown.	Birthplace, Connecticut.	Other States.	Birthplace, Ireland.	Birthplace, Germany.	Birthplace, England.	Other Foreign Countries.	Unknown.	Males.	Females.	Unknown.	Total.
Thompson	30	15	7	4	7	3	5	4	6	7	2	..	..	..	63	11	4	..	..	12	..	51	38	1	90
Tolland	2	..	..	3	1	1	2	2	5	6	..	1	..	..	14	3	2	1	..	3	..	14	9	..	23
Torrington	7	2	3	3	5	2	5	4	3	5	10	3	..	..	33	5	9	2	3	..	..	30	22	..	52
Trumbull	3	..	4	..	2	1	2	..	3	3	2	..	..	..	18	2	..	..	..	..	..	8	12	.	20
Union	..	..	..	..	..	..	2	1	1	..	2	..	..	..	6	..	..	..	..	..	..	2	4	..	6
Vernon	34	15	4	8	8	6	10	8	6	5	1	..	..	..	70	9	6	12	4	4	..	57	48	..	105
Voluntown	6	1	1	2	1	..	..	1	3	2	5	..	..	..	17	3	..	..	..	2	..	11	11	..	22
Wallingford	8	5	11	14	3	8	10	6	4	9	7	..	..	..	61	7	13	1	2	1	..	44	40	1	85
Warren	1	2	1	2	..	..	..	..	1	..	..	..	..	..	7	.	..	..	..	..	..	5	2	..	7
Washington	3	..	2	1	1	2	1	1	4	..	2	.	..	..	14	1	2	..	..	..	..	8	9	..	17
Waterbury	59	30	9	7	31	16	13	26	19	15	8	1	..	..	137	15	51	9	9	13	..	121	113	..	234
Waterford	3	3	..	1	3	1	1	..	3	4	3	..	..	..	21	1	..	..	..	..	..	9	13	.	22
Watertown	4	1	2	..	2	1	1	5	2	..	..	..	..	..	17	1	..	..	..	..	..	5	13	..	18
Westbrook	..	6	1	..	1	2	1	2	1	4	2	2	..	..	19	3	..	..	..	..	..	9	13	..	22
West Hartford	..	3	2	2	3	2	4	2	3	3	1	..	..	..	19	2	..	1	..	3	..	8	17	..	25
Weston	3	..	..	..	1	1	1	1	2	..	2	..	..	..	10	..	1	..	..	..	..	4	7	..	11
Westport	8	3	1	..	1	2	4	7	8	8	6	3	..	..	39	6	4	2	..	..	..	30	20	1	51
Wethersfield	4	3	3	3	5	..	2	2	3	4	5	1	..	..	31	2	2	..	..	..	..	16	18	1	35
Willington	4	1	..	2	1	1	2	2	1	2	5	..	..	..	15	4	1	1	..	..	..	12	9	..	21
Wilton	1	1	..	..	2	3	4	2	6	8	3	1	..	..	8	1	..	1	..	21	..	12	19	..	31
Winchester	8	11	11	11	3	2	6	10	5	6	6	..	..	..	63	6	7	..	..	3	..	40	38	1	79
Windham	29	20	2	14	12	10	9	10	4	14	2	..	..	..	83	17	7	2	6	11	..	58	66	2	126
Windsor	7	1	1	3	1	3	2	1	1	4	2	..	..	..	20	2	4	..	..	..	..	10	16	..	26
Windsor Locks	5	2	2	4	..	1	6	2	2	6	..	..	..	..	13	5	11	..	1	..	..	13	17	..	30
Wolcott	..	1	..	..	..	..	..	1	1	1	1	.	..	..	5	..	..	..	..	..	..	2	3	..	5
Woodbridge	1	..	..	2	..	2	1	1	1	4	1	..	..	..	10	1	..	1	..	1	..	2	11	..	13
Woodbury	3	..	..	3	2	2	1	5	4	8	1	..	..	..	20	5	..	..	..	4	..	13	13	3	29
Woodstock	1	..	2	5	3	..	..	2	6	7	3	3	..	..	21	6	1	1	..	3	..	13	19	..	32

BIRTHS.

The total number of births reported during the year 1878 was 13,499, not including still births, which are returned with deaths. The most complete return of still births in the State, perhaps, is from New Haven, where a separate blank is provided, on tinted paper, to avoid confusion. This system is in use quite generally in the larger cities.

The returns of births are, as a rule, more incomplete than either those of deaths or marriages. The advantages of registration, it may be, are not so apparent, and it is most decidedly the exception that a child is named within a month after its birth. The record should, however, be promptly made and completed by the addition of the child's name as soon as conveniently obtainable. The provision in the law allowing the registrar a small fee for completing the record of a birth by obtaining the name, when, as is too often the case, it is omitted altogether, has been already of decided service in completing otherwise very imperfect records. Few outside of a registrar's office realize how frequently the information that a complete record affords is sought, and how important and valuable such facts are in the varied business and social relations of life.

The record of vital statistics is indeed as valuable as any of the other public records of a town, and it is as important that they be reliable and complete as that any public records should be; indeed, their interest and value often outlast any other of the facts that are deemed of sufficient importance to be made matters for public record and preservation.

Of these births 7,073 were males, 6,355 females,—an excess of 4,174 over the total number of deaths. The proportion of males to females is 109.74 males to every 100 females, or in each 100 births 50.174 were males, 49.826 females. The mean ratio for the twenty years ending 1876 was 110.44 males to every 100 females; in 1877, 109.18 males to 100 females. The following table shows the ratio in different countries:

France,	for every 100 females,	105.35 males.
England,	" " " "	104.00 "
Austria,	" " " "	106.5 "
Russia,	" " " "	105. "
Prussia,	" " " "	105.4 "
Italy,	" " " "	106.8 "

Switzerland,	for every 100 females,			-	- 105.0	males.
Sweden,	"	"	" "	-	- 105.0	"
Norway,	"	"	" "	-	- 105.3	"
Belgium,	"	"	" "	-	- 106.9	"
Holland,	"	"	" "	-	- 105.7	"

According to the researches of Lund in Denmark, the first years of marriage are more fruitful of male births, and the latter of female, and the first child is, in the greater proportion of instances, a male. If the parties are each less than 25, the predominance of males is very marked,—105 to 50 females. This diminishes until, after fifteen years of married life, nearly an equal ratio exists,—49 males to 47 females. The ratio is then reversed, and soon reaches 95 males to 100 females. These observations extend over a long period of years, and are apparently very carefully made. The relative age of the parties, it is generally agreed, has a decided influence in deciding the sex, which is determined by that of the younger and more vigorous constitution.

There were 124 instances of plurality births—123 of twins, one of triplets—the latter of German parentage.,

There were 33 twin births in Hartford county, 30 in New Haven, 7 in New London, 28 in Fairfield, 12 in Windham, 14 in Litchfield, 7 in Middlesex, 3 in Tolland.

Of illegitimate births there were 128 reported, with about the same ratio of males to females as in the legitimate. They were distributed as follows: Hartford county, 36; New Haven, 25; New London, 17; Fairfield, 23; Windham, 11; Litchfield, 10; Middlesex, 4; Tolland, 2. The number is about the same as in 1876; in 1877 there were 155 reported.

The following table shows the parentage of foreign births. As it is the first published statement of the kind for this State it is impossible to give any comparative statements. The complexity of our population is here indicated, and it would hardly seem possible that so many heterogeneous elements were represented:

COUNTIES.	Irish.	English.	Scotch.	Canadians.	French.	Italians.	Germans.	Swedes.	Danes.	Norwegians.	Welsh.	Swiss.	Poles.	Chinese.
Hartford	532	58	21	20	20	6	88	7	3	1	2	2	2	1
New Haven	1,359	95	10	36	8	2	173	5	1	1	..	..	1	1
New London	314	65	71	165	4	2	56	..	..	..	1	..	1	..
Fairfield	480	65	4	...	3	4	111	8	1	2	2	2	4	..
Windham	190	20	1	336	10	..	10	1	..	..	..	4	..	..
Litchfield	257	22	...	...	20	..	32	3	..	..	..	1	..	..
Middlesex	141	12	2	...	3	2	20	12	.	2	..	1	..	..
Tolland	469	18	...	18	..	..	60	2	2	1	..	..	..	..
Total	3,742	355	109	575	68	16	542	38	7	7	5	10	8	2

Among other nationalities, Russia is represented by 1, the Azores 1, West Indies 4, Spain 1, Portugal 4, Siam 1, Nova Scotia 5, Sandwich Islands 2, Bohemia 1. Nearly all the nationalities of the world are here represented. A large Canadian immigration into the manufacturing towns is shown. These are for the most part French Canadians. There is a small Portuguese colony in New London, and a few in other portions of the State—sailors for the most part.

MARRIAGES.

The number of marriages reported in 1878 was 4,315, a less number than for fourteen years, although the number has not varied half a score for the last three or four years. The pressure of the times, and the difficulties in the way of acquiring even a modest competence, show pretty uniformly in a decreased marriage rate. This is the lowest number reported since 1864, when but 4,107 were reported. Of these, 2,855 were of American birth, 721 foreign, and 674 of mixed nationality.

No marriages are reported from Hampton, Harwinton, New Fairfield, and Wolcott. Bridgewater, Morris, Marlborough, Brookfield, and Lisbon report one each, and Andover, Beacon Falls, Bethany, Burlington, Hartland, Middlefield, Prospect, and Willington report two each.

The number of colored marriages is also considerably less than in any preceding year for some time, in about the same relative proportion of decrease as those of the white population.

The only offset to this decrease in the number of marriages is in the fact of a considerable decrease in the number of divorces, a less number reported—401—than for many years, those already married apparently showing a disposition to live more peaceably.

To obviate complaints relative to confusion in the fees charged for issuing a marrage license, the following form was issued. As the old plates were found to be nearly worn out, an entire change was made in the general appearance of the blank, which is now upon one sheet, with the legal fee clearly printed on the reverse side, so that mistakes are no longer possible.

STATE OF CONNECTICUT.

MARRIAGE LICENSE, valid only in the town where issued.

This certifies that the within named parties have declared their intention of marriage, and have complied with the provisions of the laws of the State of Connecticut relating to the Registration of Marriages.

Attest: ....Registrar.

Town of............. ....18....

1. Full name of Groom,....................................
2. Place of Residence,....................................
3. Age, in years,....................................
4. Occupation,....................................
5. Place of birth, ...
6. Condition,....................................
7. Color,....................................
8. Nationality of parents,....Father,........Mother,........
9. Full name of Bride,....................................
10. Maiden name, if widow,....................................
11. Place of residence,....................................
12. Age, in years,....................................
13. Place of birth,....................................
14. Condition,....................................
15. Color,....................................
16. Nationality of parents,....Father,........Mother,........

I hereby certify that Mr.....................................
and M.....................................the above named parties, were legally joined in marriage by me at..............
............this.........day of............. 18....

Attest: ....

....

At 6 and 14 state whether first, second, third, etc., marriage; also whether widowed or divorced. At 8 and 16 state whether Irish, American, English, German, etc.

[REVERSE.]

TO REGISTRARS.

Registrars issuing a certificate of license for marriage where one of the parties is a minor, without the written consent of the parents or guardian, subject themselves to a fine of one hundred dollars.

FEE FOR ISSUING MARRIAGE LICENSE.

The legal fee for issuing a certificate of license for marriage is FIFTY CENTS.

TO CLERGYMEN AND MAGISTRATES.

This certificate, duly signed, should be returned to the Registrar by the person who joins the parties in marriage, within the first week of the month next succeeding such marriage, under penalty of ten dollars for neglect.

Any person solemnizing a marriage under this license in any other town than that in which it was issued, or joining any persons in marriage without first having received a certificate of license, is liable to a fine not exceeding five hundred dollars, or imprisonment in a common jail not exceeding one year, or both fine and imprisonment.

Sign this certificate of license with name, official title, and residence.

DEATHS.

The number of deaths recorded each year is an index of the annual loss to the State which necessarily results from the ebb and flow of the tide of life. The compensating swing is shown by the birth-rate; the gain, if gain there be, by the excess of births over deaths, and the influx of immigration; the latter, however, does not appear on the registration records. Prosperity is indicated by a high birth-rate and low death-rate, if the other elements in the problem correspond. Security to life, vigorous manhood, and peaceful old age, or the reverse; premature mortality, death at the threshold of life, wasted energies, and burdened age are unfolded in these records of the vital movements of the year. As the death-rate varies in different localities, and different years and

seasons, showing often double or even fivefold the normal rate, the importance of the study of these variations must be obvious, influenced as they are by local conditions.

The value of the sanitary observances of each locality is tested by the comparative freedom it enjoys from the devastations of diseases that should be controlled, and the reasonable expectation it can give of protection from influences that sap life and vigor, but yet over which the individual, however intelligent, has no control. The Austrian minister of commerce said, "Statistics are no longer viewed as a mere theoretical science for the gratification of the curiosity of the learned, since they subserve the practical ends of political society, and lend service to administration as well in determining the value of existing institutions and laws as in weighing measures not yet carried out." The intimate relation between political science or statesmanship and vital statistics is apparent as the varied relations of life to be influenced by legislative enactments alike are influenced by the laws of development and inheritance.

In studying the vital statistics of 1878, the chief effort has been expended in the selection and formation of tables that should present the different facts clearly and distinctly, and yet avoid any unnecessary detail. Some typographical errors in the construction of so many new forms of tabular statement are perhaps unavoidable; a glance at the factors that are credited with a wrong showing will rectify the errors in nearly every case. The first set of tables showing causes of death gives the cause for each death in the towns which are arranged by counties. By this table the manifestations of disease will be seen to fluctuate greatly from year to year; the same causes do not produce the annual mortality each year. There are, of course, certain endemic forms that appear from year to year, like consumption for instance, which is about as uniformly distributed as any one disease, but for the most part the causes vary very decidedly.

The value of this table will increase from year to year, and it forms indeed a very important item in the sanitary history of each town. These facts are yearly recorded and gathered, and by this means they are utilized to teach many an important lesson. But little attempt is made to draw inferences from these tables this year, as the exact basis of the census will render future calculations more valuable, and, indeed, scant time was left after constructing, with only general models, these comprehensive tables. The second

shows the age, time, and sex, with reference to each disease; for convenience of reference the diseases are arranged alphabetically. In the last table, the nationality, age, time, and sex of those dying in each town are shown, the towns arranged alphabetically.

The year was not characterized by the existence of any general epidemic, but localized epidemics of diphtheria, scarlet fever, and malarial fevers were very common. The greater proportion of deaths from these causes occurred in comparatively a few towns. Scarlet fever was more prevalent in the first quarter of the year, diphtheria in the third and fourth. There were some unusual causes reported. Mumps is credited with one death, but it was by metastasis to the glands about the windpipe, which, becoming enlarged, caused suffocation.

Bleeding at the nose, base ball, acute splenic fever, and lupus of the face are each credited with one death. Yellow fever was reported, but the death occurred at sea and the burial also; the captain of a ship imprudently landed at a fever-stricken port. The unusual number of deaths from accidents has already been alluded to. Two deaths are reported from exposure, and three from freezing, and three from lightning. Stricture of the œsophagus is reported in one case. The following table shows the deaths in each quarter:

From January to March,	2,385
From April to June,	2,176
From July to September,	2,586
From October to December,	2,157
Not stated,	48
	9,352

The approximate ages are shown in the following statement:

Under 1,	1,074	
From 1 to 5,	1,037	
Total infantile,		2,741
From 5 to 10,	565	
From 10 to 20,	674	
Total,		1,239
From 20 to 30,	814	
From 30 to 40,	772	
From 40 to 50,	674	
From 50 to 60,	689	
Total,		2,949

From 60 to 70,	773	
From 70 to 80,	868	
Over 80,	734	
Total old age,		2,375
Age not stated,		48
		9,352

The infantile mortality is about the usual ratio, nearly thirty per cent., which does very well for human beings, but wouldn't do at all for sheep or cattle if the essential conditions of their vitality were so disregarded. The greater proportion of deaths occurs during the first twelve months, and disorders of nutrition are almost invariably the cause, although meningitis, convulsions, and brain disease are credited apparently with a large percentage.

The deaths during the third period represent the greatest loss to the State, as these are the producers, so to speak, who, in addition to self-support, are accumulating or supporting others. As will be seen by reference to the tables, the deaths from consumption and typhoid fever fall heaviest among this class.

The nationality is not quite so complicated as that of births, although decidedly heterogeneous. A much larger proportion are born within this State, and with the mixed population the birthplace is not so generally stated as in the case of births. The following statement shows the proportion:

Birthplace,	Connecticut,	6,384
"	Other States,	970
"	Ireland,	946
"	England,	398
"	Germany,	175
"	Other Countries,	314
"	not stated,	165

The Canadians are proportionately as well represented as in the nativity of births, indicating a longer residence.

Errata, page 56.—Consumption, age not stated, 20; disease of brain, month not stated, 1, should be added.——Debility and atrophy, read 22 instead of 29, from '70 to '80, and 58 females instead of 38, making total 137. Page 27, footing of 5th column, read 13 instead of 70.

General Walker draws the following conclusions concerning the mortality among foreigners:

"Among the Irish, a marked liability to general constitutional diseases, including consumption and Bright's disease of the kidneys, with exemption comparatively from diseases of the febrile group." In this State the mortality from consumption in the factory towns among the operatives, is well marked, especially among the younger women. The change to indoor employment, with close restraint, and dust laden atmosphere manifests its effects after a comparatively short time.

"Among the Germans, a reduced mortality from general constitutional diseases, and a decided liability to the febrile group, otherwise a general uniformity,—no undue prevalence of one group.

Among the English and Welsh, a liability to diseases of the nervous, circulatory, digestive, and integumentary systems,—comparative immunity from general constitutional diseases. Special forms scarlet fever, diphtheria, croup, whooping-cough, erysipelas, apoplexy, and paralysis are most fatal.

Among the Swedes, Norwegians, and Danes, a marked liability to diseases of the digestive system especially dysentery, diarrhea, and enteritis, and extraordinary mortality from the febrile group, immunity from deaths from general constitutional diseases, and from those of the circulatory, nervous, urinary, and integumentary systems.

Among the Scotch an evenness to the distribution among the several groups within marked, exception only of diseases of the nervous system, and of the organs of locomotion, cancer, paralysis, measles, and whooping cough, the most marked, immunity, small pox, scrofula, and the fevers.

Among the French the same evenness as in the Scotch, with more irregularity among the specific diseases than in case of the Scotch.

LAWS

CONCERNING THE REGISTRATION OF

BIRTHS, MARRIAGES, AND DEATHS.

REGISTRATION LAWS.*

It shall be the duty of the State Board of Health to have the general supervision of the State system of registration of births, marriages, and deaths. Said board shall prepare the necessary methods and forms for obtaining and preserving such records, and to insure the faithful registration of the same in the several counties, and in the central bureau of vital statistics at the capital of the State. The said Board of Health shall recommend such forms and amendments of law as shall be deemed to be necessary for the thorough organization and efficiency of the registration of vital statistics throughout the State. The secretary of said Board of Health shall be the superintendent of registration of vital statistics. As supervised by the said board, the clerical duties and safe keeping of the bureau of vital statistics thus created shall be provided for by the Comptroller of the State, who shall also provide and furnish such apartments and stationery as said board shall require in the discharge of its duties. That the said board, on or before the first day of December in each year, shall make a report in writing to the Governor, upon the vital statistics and the sanitary condition and prospects of the State. †

SECTION 1. Every registrar of births, marriages, and deaths shall hold office for one year from the first Monday in January next succeeding his appointment, and until his successor is appointed and qualified.

SEC. 2. The registrar shall ascertain, as accurately as he can, all the births, marriages, and deaths occurring in his town, and record the same in a book or books kept by him for that purpose, in such form and with such particulars as shall be prescribed by law. He shall give licenses to marry, according to the provisions of law, and shall make and perfect all records of the birth of any child born in his town. He shall record in the books furnished

* The following provisions are compiled from the unrepealed portions of the different statutes.

† January Session, 1878.

by the Bureau of vital statistics such facts concerning the births, marriages, and deaths in his town as may be therein required; and he shall amend his records as he may discover omissions or mistakes therein; annually, on or before the twenty-fifth day of January, shall send the superintendent of vital statistics an attested abstract of said records for the year next preceding the first day of said January, which shall be made in such form as shall be prescribed by said superintendent, and shall deposit a true copy thereof with the town clerk.

Sec. 3. Every physician or midwife, who shall have professional charge of the mother at the birth of any child, and every attendant who may act as midwife at such a time, where no physician or midwife is employed, shall, during the first week of the month next succeeding such birth, furnish the registrar of the town wherein such birth may have taken place a certificate signed by such physician, midwife, or attendant, stating, from the best information which the signer of said certificate can obtain, the facts required by the Bureau of Vital Statistics.

AN ACT CONCERNING THE REGISTRATION OF BIRTHS, MARRIAGES, AND DEATHS.

Section 1. The registrar, for completing each record of birth by inserting the full name of the child, shall receive from the town ten cents, and for ascertaining, recording, and indexing each birth of which no certificate has been furnished, fifty cents.

Sec. 2. Every physician residing without the town wherein a birth or death occurred under his charge shall make return thereof to the registrar of such town, and he shall receive therefor from the registrar an order on the treasurer of such town for the fee prescribed by law.

Sec. 3. No deceased person shall be buried in any town having an incorporated city within its limits until a burial permit, stating the place of burial and that the certificate of death required by law has been returned and recorded, has been given by the registrar, who upon receipt of such certificate shall issue such permit; and upon application, when permits are required, the attending physician of the deceased, and the coroner in case of an inquest, shall give such certificate; or if there be no attending physician, or his certificate cannot be obtained early enough, or where immediate burial is required, any member of the local board of health, or any physician employed to have charge of the poor

of said town or city, shall give such certificate to the best of his knowledge and belief, and the registrar shall record the place of any burial other than in a public cemetery, and for each permit shall receive twenty-five cents from the town.

Sec. 4. In all towns the secretary or committee of each cemetery association shall report to the registrar of the town in which such cemetery is situated the name of the sexton at present in charge of such cemetery, and of any change hereafter.

Sec. 5. Every person having charge of any burial place shall during the first week of every month return a list, for which he shall receive fifty cents, of all the interments, disinterments, and removals made by him during the next preceding month, with the date thereof to the registrar of the town, who shall record the same in a book to be furnished by the bureau of vital statistics.

Sec. 6. Every person violating any of the provisions of this act shall be punished by a fine not exceeding twenty-five dollars.

Sec. 7. All acts and parts of acts inconsistent herewith are hereby repealed.

Approved, March 28, 1879.

AN ACT RELATING TO RETURNS OF DIVORCES.

Section 1. The returns of divorces required of clerks of the superior court to the State librarian, by section three, part sixteen, chapter one, title three of the general statutes, shall hereafter be made to the secretary of the State board of health, which returns shall be tabulated and published in the annual report of said board.

Sec. 2. This act shall take effect from its passage.

Approved, March 28, 1879.

TOWN OR CITY BY-LAWS.

Any town or city may enact by-laws, not contrary to law, more effectually to obtain a perfect registration of births, marriages, and deaths; and the registrar of the town in which such by-laws may be enacted shall execute their provisions under the same oath and penalty as if they were the statute laws of the State.

FEES.

Registrars of births, marriages, and deaths shall receive for ascertaining and recording each birth, marriage, or death ten

cents; for issuing a certificate of license for marriage, fifty cents; for making an abstract, two dollars; for each name on such abstract over two hundred, two cents.

No person shall open any grave for the disinterment of the body of any deceased person, in any public or private cemetery or burial-place, or disinter or remove such dead body from the town in which the death took place, without having procured from the registrar a permit therefor.—Feb. 28, 1877.

DISINTERMENTS.

On the receipt by the registrar of a certificate of death, properly made in the form furnished by the superintendent of vital statistics, the registrar shall issue a permit for the disinterment or removal of the body of any deceased person, stating therein the locality of the interment, disinterment, or removal. No permit for the disinterment of the body of any deceased person during the months of June, July, August, or September shall be issued, except when required for the purposes of a legal investigation.

Every registrar of births, marriages, and deaths shall receive for issuing each permit as herein provided the sum of twenty-five cents.—Feb. 28, 1877.

RETURNS OF BIRTHS AND DEATHS.*

Duties of Persons who Shall Make Returns of Births and Deaths to the Registrars.

BIRTHS.

Physicians or midwifes, or any person acting as midwife at the birth of a child, should make return of the same, upon the blanks furnished by the Registrar, within the first week of the month next succeeding such birth, signed by the person making the returns, stating the facts therein required from the best information which the signer can obtain. Each birth should be promptly reported, and the record of the name inserted afterwards. Parents should be instructed to report the name to the physician or registrar as soon as determined. A provision is made for a fee for the registrar on completion of an imperfect record.

DEATHS.

It is the duty of the attending physician to report on the blanks furnished by the registrar each death, with all the facts required

* The following suggestions concerning the provisions of the registration laws are given in reply to questions that have been submitted.

by law. In cities, this certificate of death should be in the hands of the registrar before a burial permit is issued. There is no other way to secure complete returns of deaths in populous places than by the system of burial permits. The testimony is unanimous on this point. By reference to the bulletins of the National Health Board it will be seen that the cities which do not require a burial permit previous to interment are rapidly becoming exceptional. The attention of physicians is respectfully urged to the requirement for promptly filling out certificates of death. A little care on their part will save a great deal of unnecessary friction. If the cause of death be written in by the physician, and the certificate signed by him, the other facts can be readily filled out by the undertaker.

It is the duty of the physician to sign the certificate of death *forthwith.* The friends of the deceased should secure from the attending physician as soon as may be after death the certificate required by law, and furnish it to the registrar, who shall then issue the permit for burial. Proper respect for the dead demands at least that much attention be paid to their memory. The friends of the deceased are the proper persons to arrange this matter, to see that the facts concerning the last event in life about which the State concerns itself with relation to each citizen be correctly stated. The business and social elements involved also justify the utmost precision and care. Protection of life and prevention of crime are also involved in this transaction.

Where burial permits are not required, the physician should return the certificates of death each month to fulfill the requirements of the law. Negligence here is by far too common.

COMPENSATION.

The fee for returning the certificates of birth and death is twenty-five cents. The penalty for violation or non-compliance with the registration laws relating to returns of births and deaths, is not less than ten dollars, nor more than twenty-five dollars.

DUTIES OF PERSONS BEFORE WHOM MARRIAGES MAY BE SOLEMNIZED.

Authority and its Limitations.

All judges, justices of the peace, and ordained or licensed clergymen belonging to this State or any other State, so long as they continue in the work of the ministry, may join persons in marriage,

and all marriages attempted to be celebrated by any other person shall be void; but all marriages which shall be solemnized according to the forms and usages of any religious denomination in this State shall be valid.

Marriage within certain degrees of consanguinity is by law declared void.

CERTIFICATE OF LICENSE FOR MARRIAGE REQUIRED PREVIOUSLY TO THE CEREMONY.

No clergyman or magistrate is authorized to solemnize a marriage until a certificate of license is first delivered to him, under penalty of a fine of not more than five hundred dollars, or imprisonment, one or both. The marriage license can be used only in the town where it was issued; if used in any other town, the officiating clergyman or magistrate is liable to a fine of not less than one hundred dollars, or imprisonment, one or both.

RECORD AND RETURN REQUIRED.

Every clergyman or magistrate is required by law to return to the Registrar, within the first week of the month next ensuing, the license certificates, with the fact, time, and place of each marriage certified thereon for all marriages celebrated by him during the month preceding, under a penalty of ten dollars for each omission.

The certificates should be signed with name and official title.

LAWS CONCERNING MARRIAGE.

(General Statutes, Title XIV.)

Chap. I.

Sec. 1. What Kindred cannot Marry.
Sec. 2. Marriage License.
Sec. 3. Certificate of Marriage.
Sec. 4. Certificates *prima facie* evidence.
Sec. 5. Who may join persons in marriage.

Section 1. Marriage between certain relatives prohibited.

Sec. 2. No persons shall be married until one of them shall inform the registrar of the town in which the marriage is to be celebrated, or in case of his inability the town clerk, of the name, age, color, occupation, birth-place, residence, and condition (whether single, widowed, or divorced) of each. Such registrar or town clerk shall thereupon issue his certificate that the parties therein named have complied with the provisions of this section, which

certificate shall be a license to any person authorized to celebrate marriage to join in marriage within said town only the parties therein named; but no such certificate shall be issued if either of the parties is a minor under the control of parent or guardian, until such parent or guardian shall give to the registrar or town clerk his written consent; and any registrar or town clerk who shall knowingly issue such certificate without such consent shall forfeit to the State one hundred dollars. And any person who shall join any persons in marriage without having received such certificate shall forfeit one hundred dollars.

SEC. 3. Every person who shall join any person in marriage shall certify upon the license certificate the fact, time, and place of such marriage, and return it to the registrar of the town where it was issued, upon or during the first week of the month next succeeding such marriage, and upon failure thereof shall forfeit ten dollars. The penalties for joining persons in marriage in violation of this and the preceding section shall be paid to the town where the offense is committed, and the registrar shall sue therefor.

SEC. 4. The certificates required by the preceding sections of this chapter shall be *prima facie* evidence of the facts therein stated.

SEC. 5. All judges, justices of the peace, and ordained or licensed clergymen belonging to this State or any other State, as long as they continue in the work of the ministry, may join persons in marriage; and all marriages attempted to be celebrated by any other person shall be void; but all marriages and rites which shall be solemnized according to the forms and usages of any religious denomination in the State shall be valid.

TITLE 20. CHAP. II.

SEC. 17. Every person who shall knowingly publish a false and fictitious notice of any birth, marriage, or death shall be fined not more than one hundred dollars, or imprisoned not more than six months.

Chap. VII.

SEC. 2. Penalty for bigamy: imprisonment in State Prison not more than five years.

SEC. 3. Every man and woman who shall marry within any of the degrees of kindred specified in the first section Chapter I, Title XIV, shall be imprisoned in the State Prison not less than two nor more than five years.

SEC. 21. Whoever undertakes to join persons in marriage, knowing that he is not authorized so to do, shall be fined not more than five hundred dollars, or imprisoned not more than one year, or both.

DUTIES OF REGISTRARS.

The registrar is the executive officer in each town for the registration laws, and it is his duty to see that they are complied with. It is his duty to make his record as complete as he can. Special provision is made by the act of 1879 for the completion of returns of births by securing the name of the child. The records of births are of little worth without the name.

In cities he is to issue burial permits when required by law, and also permits for removal from one town to another. In case of disinterment or removal from one cemetery to another in the same town a permit is not required.

He shall record the facts required by law concerning births, marriages, and deaths in the record books furnished by the State, and should refuse to receive a certificate, glaringly defective, as a satisfactory performance of the returns required by law. Where the required facts are manifestly unobtainable, of course a virtue must be made of necessity, and the incomplete returns accepted.

It is the duty of the registrar to issue marriage licenses on receiving a declaration of intention of marriage from one of the parties, and to record all marriages returned to him as solemnized in his town. In case of his inability the town clerk shall perform these duties.—*General Statutes, Title 3, Part V, Sec. 2.* The registrar is forbidden by law, under penalty of one hundred dollars, to issue a marriage license when either of the parties is a minor, under the control of a parent or guardian, unless such parent or guardian shall give to the registrar his written consent.

DUTIES OF SEXTONS.

Every person having in charge a burial place shall return to the registrar a monthly list of all interments, disinterments, and removals, in case there be any during the month. For such list he is entitled to a fee of fifty cents from the town.

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PLAN OF THE
CITY OF HARTFORD
Showing
SEWERS
Scale of feet.
Compiled and drawn by
Chas. L. Burdett, Civil Engr.
1880
Notes.
Sewers in Park River District are shown by solid lines.
" " North East " " " " broken "
" " Franklin Ave. " " " " broken "
" discharging into Conn. River are shown by dotted lines.
Figures in River are soundings below ordinary water level.
" underlined show heights of sewers above City Base
Other figures show heights of surface above " " ,
and size of sewers.
WETHERSFIELD COVE.
CONNECTICUT RIVER.
CONNECTICUT RIVER.

THIRD ANNUAL REPORT

OF THE

State Board of Health,

FOR THE

FISCAL YEAR ENDING NOVEMBER 30, 1880.

Printed by Order of the Legislature.

HARTFORD, CONN.:
PRESS OF THE CASE, LOCKWOOD & BRAINARD COMPANY.
1880.

State of Connecticut.

Office of the State Board of Health,
State House, Hartford, Dec., 1880.

To His Excellency, H. B. Bigelow, *Governor of the State of Connecticut.*

Sir: In compliance with the laws of this State, I have the honor to present to you the accompanying report of the State Board of Health for the fiscal year ending Nov. 30, 1880.

Very respectfully,

C. W. CHAMBERLAIN, M.D.,
Secretary State Board of Health.

MEMBERS OF THE BOARD.

	Term expires.
John S. Butler, M.D., President, Hartford,	July, 1886
Hon. A. C. Lippitt, New London,	" 1886
Prof. C. A. Lindsley, M.D., New Haven,	" 1884
Prof. W. H. Brewer, New Haven,	" 1884
Hon. A. E. Burr, Hartford,	" 1882
Robert Hubbard, M.D., Bridgeport,	" 1882
C. W. Chamberlain, M.D., Hartford, Secretary.	

GENERAL REPORT.

The sanitary history of the past year, unlike its immediate predecessors, has not been marked by impressive and striking events that force upon the attention of the most heedless and thoughtless, even, some idea of the value and power of public hygiene, its pre-eminent importance, and indeed vital necessity, as well as the disastrous results that follow neglect or disregard of sanitary laws. There has, however, been a steady and lasting improvement; the lessons of the recent epidemic of the South have not yet been forgotten, while much clearer and more intelligent ideas of sanitation in general have become diffused among the people, as shown in the manner local epidemics and individual cases of many zymotic diseases are discussed and acted upon. In many instances the first question asked is, What is the cause; and it is singular what queer unsanitary conditions are found which have been overlooked or forgotten; for example, under the very bed of a patient that had died from erysipelas, following a comparatively slight injury, the open mouth of a waste-pipe was discovered. The room was on the third floor, and when the house was constructed it was the plan to have placed a basin here; the waste-pipe was therefore carried up, left open at the level of the floor, and forgotten. As there were basins on each floor beneath, and only a large trap in the cellar, a moment's reflection will show that this opening, the highest in the system of waste-pipes in the house, ventilated them all, while oftentimes the communication with the sewer was direct, such a trap furnishing an unsatisfactory and inconstant protection. A few feet more of waste-pipe would have brought it directly beneath his nose; it was near enough, however. This improved public sentiment has been marked in this State; individuals and health authorities have in many cases successfully contended with the sanitary problems brought thus directly to their notice.

There have also several States created State Boards of Health since our last report, as New York, North Carolina, and Iowa; and others

have reorganized those already existing, conferring new powers. There are still many among us who see the causes of disease, in some mysterious condition of the atmosphere for instance, beyond man's knowledge or control, so perchance they breathe in the floating excrementitious particle sun and wind have set in motion, and chancing upon the typhoid variety, succumb to this form of disease. The atmospheric theory, indeed, should have due consideration; such mysterious conditions have in times past devastated large areas through Asiatic cholera. Or a diphtheritic germ thus floating, its life and vigor maintained by the filth-polluted air, finds lodgment in his throat, or enters the blood by way of the lungs, and the malignant disease, strange to say, follows after. But being mercifully protected from such evils, he slakes his thirst, while on his way, at a well, not noticing the cess-pool and privy-vault on the adjacent bank above, and the fell typhoid reaches him thus at last. There is nothing mysterious about this : the causes are plain enough. The inference must not be drawn that filth is the sole cause of disease, or that all dirt is filth in a sanitary sense. By filth is meant organic substances in process of putrefactive decay, and the germs or virus of disease, whichever it may be. Many of the products of decay are apparently pure, thus excrement-polluted water may be as clear and sparkling as you please; indeed, the gases and chemical salts impart quite a pleasant taste and exhilarating sparkle, and the water from wells thus polluted is often sought far and near for drinking purposes. Neither is it strange, while we are upon this vein, that women shut up in ill-ventilated rooms, sleeping at night often with several children in one small room, kept close for warmth's sake, and others pursuing sedentary occupations, breathing polluted air, or rather re-breathing the same air repeatedly, or drinking contaminated water, should at length develop pulmonary consumption, or fall a ready victim to the first acute attack of disease or exposure to contagion, or worse yet, drag out miserable lives, broken in health and vigor.

The personal element in the equation must not be overlooked; oftentimes exposure to contagion the most direct, as rooming with malignant scarlet fever or confluent small pox, results in no harm; not every blossom produces fruit, nor every seed a plant; this truth extends to the germs of disease. In this report the germ theory and its terms will be freely used; it is, however, tentatively held subject to revision; the terms are generally pretty commonly used

and familiar, and germ is a much more pleasant term to use than a granular particulate aggregation, or the like. That diseases are conveyed through organic agencies is pretty generally believed; the yeast theory is exploded, although the terms zymotic and the like are retained, as illustrating a general idea, although the exact interpretation no longer is accepted. The germ theory is not yet proven, and while doubtless true in many points, requires further study and proof before it ranks among accepted facts. It is not intended to discredit the theory, but simply to explain its status.

An encouraging sign of the rapid development of a healthier sentiment upon all these topics is afforded by the attitude of the clergy and religious press, the results of direct violation of the plainest hygienic laws are not charged upon the Creator, and it is questioned whether it is an exemplification of Christian principles to crowd tenants into death-traps, cheaply constructed by omitting all hygienic protection. The sanitary inspector, as well as the schoolmaster, is abroad, and the results are manifest. The attention paid to sanitary laws, in arranging for the new High School at Bridgeport, is another illustration of progress where, indeed, the whole question of deciding upon the plans submitted depended upon the question of affording a plentiful supply of pure air without the exposure in cold weather that results from recourse to doors and windows to secure it, as is generally, alas, the case, rushing into greater danger to escape one set of evils. The cold blast upon heated frames "slays like a sword"; the lungs, weakened by the vitiated air supplied to them are easily congested, and sickness and death completes the series. The instructions to tenants issued by the Norwich Savings Bank, and their regard to sanitary construction, is another indication. Indeed, these might be multiplied almost indefinitely.

PREVALENT DISEASES.

There have been more epidemics by far than last year, although the mortality in many of them cannot be said to have been excessive. The disease that has been most universally diffused is the measles, and in few instances has the whole mass of the children been so generally affected as in this. It seemed that scarcely any escaped. Having previously had the disease did not satisfy its demands in all cases, and even a third seizure is mentioned where the victim had been twice afflicted. The disease appeared first in the southwestern part of the State, or was thence first reported.

Six deaths in New Haven in the previous December mark its appearance there. It spread with considerable rapidity. A death was reported in Hartford in February last. The latest deaths were reported in June from Waterbury. In many of the smaller towns the disease continued later, although unreported. The mortality is not large, the usual complications causing the greater part, rather than the disease directly. The form of Rothëln, or German measles, as it is often called, was also reported occasionally. The remarks of Dr. Lindsley upon the spread of the disease and the desirability of closing schools in general epidemics, or restraining attendance by inspection, are as follows:

"The rapid spread of the disease is, I believe, largely chargeable to the intercourse of the children in the public schools. There are also more cases of whooping cough than common (New Haven), and this disorder is assuming the character of an epidemic. Although the Board of Education have regulations intended to prevent the spread of contagious diseases in the public schools, I have been informed by authority that they have not been vigilantly enforced respecting either measles or whooping cough. It is assumed to be the inevitable fate of all children to be afflicted with these disorders, and therefore it is of no sort of importance to observe any precautions to prevent them. Several fatal results may be attributed to this theory, and it is sure to be productive of many more if continued. Measles and whooping cough are not trifling ailments; they are often malignant and deadly. Of the sixteen deaths by zymotic diseases in New Haven during the month of February, six were caused by measles, four by whooping cough. It is not true that every child will have these diseases. A large number escape and many more would if proper precautions were taken. But then if it were true, there is a good and a bad time to have them, and I can scarcely think of an act of more perilous imprudence than to introduce into a school-room of fifty children these dangerous diseases, when there is almost sure to be among the fifty some whose impaired health at the time makes it emphatically a bad time to take these disorders. Children that under favorable circumstances will pass through them with complete safety will under unfavorable circumstances as often perish, or if they survive the immediate attack will have their health more or less permanently broken in consequence."

Many authorities coincide with these views, notably Dr. Raymond, Sanitary Superintendent of Brooklyn, N. Y., who has published a pamphlet on the epidemic in that city, in which he contends that measles is not a trivial disease, and thus concludes:

"Measles, now (May) epidemic in Brooklyn, has already caused seventy-three deaths, is one of the most virulently contagious dis-

eases. Its contagiousness, developed at a very early stage, is conveyed by families, where a case exists from the clothes of those lately in attendance upon a case (F. White), from boxes sent home from schools where measles have prevailed, one cannot remain in the same room, or even house, without danger of taking the disease. *One attack does not protect.* In view of these facts the Board of Health directs the exclusion from the schools of all children living in houses where measles exist, and forbids their return until the case is well and the premises are fumigated with sulphur."

The most dangerous complications, as has been stated, are those relating to the lungs, and the disease is often followed by consumption thus developed, especially when there is a tendency inherited to consumption. We would advise that the greatest care should be exercised in guarding such children from exposure to the disease; also where acute lung affections already exist. The dangers of taking cold after measles are too little guarded against, and too often health is ruined from carelessness here. Scarlet fever has been locally epidemic in but one or two instances and not very malignant. Whooping cough has been an unusually prevalent epidemic in many places, but not unusually severe or fatal. The susceptibility to mumps appears to have been nearly exhausted last year. Influenza and catarrhal affections have been more or less prevalent during the spring, and have become epidemic occasionally in different localities. Cholera infantum has not been as prevalent as usual in several localities. Diphtheria in general about as usual. This disease has been locally epidemic in several places and of malignant type. A discussion of its manifestations will be found later, as also of

MALARIAL DISEASES,

several new forms of which have been reported, malarial bronchitis or broncho-pneumonia, malarial cystitis, and enteric varieties, congestive chills are increasing in frequency. While the invasion of new territory has not been rapid, the frequency in its former seats has often very notably increased. Cerebro-spinal meningitis has not much increased It must now be considered endemic.

Pneumonia, bronchitis, and pleurisy have been unusually prevalent, and continuing even into the summer months. Typhoid fever and diarrheal diseases have been epidemic locally in several instances, and are discussed later. The nearest approach to a general epidemic was in the case of measles; a mild type of influenza comes next.

In general the health of the State has been not as good as during the two preceding years. Still there has been no alarming increase in the general mortality.

SMALL POX.

Small pox reappears in the mortality lists for the first time since 1876, although there have of course been cases meanwhile in different parts of the State, and perhaps a few deaths, but they have escaped record. The deaths occurred in a localized epidemic in December, 1879, and January, 1880, since our last report. It broke out among a colony of Portuguese, many of whom were sailors. It was of course imported, and from their negligence and the vile sanitary conditions of their quarters it acquired considerable headway, and a dangerous epidemic was threatened, but suppressed by the active and intelligent efforts of the Mayor and his coadjutors. Unfortunately there was no pest house, which added to the difficulties of isolation, so that it is not strange that there were some cases in other parts of the city. We were consulted in regard to the need for a pest house—how it should be constructed and regulated. Instructions concerning disinfection were furnished, as comprised in the directions of the National Board of Health, reprinted in our last report. As the Legislature was in session assistance was also afforded in securing additional powers not heretofore provided in the city charter, to meet this and future similar exigencies. These instructions were now issued for general distribution in similar cases.

FILTRATION OF POTABLE WATER.

The filtration of river water, or the purification of water used for the general supply of towns or cities, has several times been brought before us during the year. The experience of continental cities of London, and many cities and towns in our own country, has fully determined the question that impurities held in *suspension* in the water thus used can be almost if not entirely removed by suspension and filtration-beds properly constructed. Where much earthy matter is carried along by the river currents, as finely-divided clay, in the rivers of the southwest especially, or where the stream flows for a great portion of its course through cultivated fields, and thus acquires a larger proportion of earthy and organic vegetable debris. A reservoir where these suspended matters

may gradually settle to the bottom is fully as important as the filtration itself. To complete this process to any degree of perfection would however require weeks, and often months, but it is of the greatest assistance to the filtration, even when partially accomplished, as quantities of earthy and other substances that render the water turbid settle, while the water remains quiet in these subsidence-reservoirs, and so do not clog the filters. There is still, in the discussion of the whole question of impurities in water a great deal of confusion between *suspended* matters and those in *solution*. Of course every one comprehends the illustration that sugar, for instance, is dissolved in water, and clay suspended in a finely-divided state, and that while the water in which large quantities of pure sugar is dissolved remains clear and bright, it is not in one sense pure water, that is, it has a foreign substance dissolved in it, held in solution, that this water will dissolve salt and still remain clear, and still other substances might be added, and still the water remain clear while containing large quantities of foreign matters in solution, but it is difficult to make people bear in mind that many organic substances of vegetable or animal origin, in a state of decay, may be in a similar manner dissolved in water that appears clear and bright. That oxygen being the great purifier, the destroyer of filth, which when *completely* oxidized is broken up and made over into harmless compounds—incompletely oxidized substances, in other words filth—-undergoing the process of decay, may be converted into forms easily dissolved in water, and which, being colorless, do not offend the eye, and tasteless and odorless, do not offend the senses in any manner. Nor do the germs of disease, or whatever may be their communicable virus, if not germs, which are clearly and incontestably conveyed by means of water and milk from place to place, and from one animal to another animal, as well as from one human being to another, do not reveal themselves to the senses in either, no more than the organic impurities which enable them to exist and multiply. Every one knows upon reflection that the finely-divided clay or earth that renders the water turbid, is more offensive than dangerous, and while not desirable is not harmful, as the consumption of the unfiltered waters of the rivers of the southwest abundantly confirms. The impurities that are the most dangerous are therefore those in solution, which are not removed by any filtration, although the percentage may be slightly decreased during the process.

Rivers and streams, therefore, that have received any considerable amount of sewage, should be avoided as sources of public supply. The excrementitious matter that is not completely oxidized is soon rendered soluble, so that a sewage-polluted stream shortly becomes clear; but the compounds formed are completely oxidized exceedingly slow. The nitrites, nitrates, phosphates, and sulphates, and the like, together with large quantities of infusorial life, the minute animalcules that live upon these decaying organic compounds, betray sewer contamination long after the water has ceased to offend the senses. The microscope here becomes a valuable aid by discovering to us these lower forms of organic life, the minute organisms invisible to the unaided eye. The presence of these infusoriæ in itself does not render the water harmful, but it is a proof or indication of large quantities of dissolved filth—organic substances undergoing changes in which, indeed, these animalcules assist. Their presence is beneficial, as they live upon the filth, are developed out of it, so to speak, and are part and parcel of the processes of its re-conversion into harmless and indeed useful productions.

With this fully understood, that water largely contaminated with sewage is unsafe as a source of supply, as no feasible processes will render it pure, and that water that has received sewage at all is exceedingly undesirable as a source of supply, even if the stream has flowed many miles, the advantages of filtration can be better understood, and what can and cannot be accomplished by it.

Right here, and at the expense of some irrelevance and of repetition, for the subject is of importance enough to bear repetition, it may be stated that freezing does not free water from organic impurities. The ice probably contains less than the water, proportionately, but enough remains to produce disease and death oftentimes, where ice has been collected from sewage-polluted ponds. As we have repeatedly come in contact, in different parts of the State, with ice-houses along the banks of polluted ponds, sometimes where the water was exceedingly vile, recognizable by its odor easily in the summer months, and, as a corollary, occasionally sickness and death directly traceable to such ice, the fact is noted in this connection while considering dissolved impurities.

In considering whether to use as a source of supply water that must be filtered that may be near at hand, and a clearer supply more remote, it must be remembered that one or more extra filtering-beds must be made in order that they may furnish the supply

while the others are cleaned, and that this cleaning must be repeated often: at least once in three months. Kirkwood gives $89\frac{3}{4}$ United States gallons per foot square of sand surface of the filter-bed per diem as an average rate. This is accurate enough for use in estimating the size of the beds required for the water supply. The rapidity of filtration depends, among other things, upon the amount of suspended impurities to be removed. In deciding upon the absolute need of filtration, the source of supply should be considered. Of course all water stored in reservoirs gets the benefit of subsidence, more or less. If a mountain brook or lake or upland surface-waters be the source of supply, filtration, though always desirable, is not indispensable; indeed, is hardly required. Water collected from streams running through inhabited districts is liable to be contaminated by the waste from factories, the washings from the fields conveying the refuse of plants, etc., as well as the fertilizers used, and all manner of floating débris. These, as well as the animal and vegetable growths in the water, are removed by filtration. The minuter forms of animal and vegetable life often exist in large quantities, and give by their decay in the pipes that fishy odor that is often so objectionable. Indeed, the removal of the smaller fishes, etc., becomes sometimes of importance.

BAD ODORS AND TASTES.

The objectionable taste and smell that all ponded supplies of brook and river water occasionally manifest, have been repeatedly brought to our notice as evidences of marked impurity, and as proof that the water requires filtration, and is unhealthful. This was the case this summer with the water in Hartford, New London, and other places, and we were called upon to pronounce such waters dangerous to health. Of course there are many smells and tastes that are proof of water that is not potable, but this peculiar odor and taste, variously described, is not deleterious to health.

The bad odor of the water may be due, according to Nichols, to a minute vegetable growth which often appears like a scum on the windward shore of a pond. This is a species of *Algæ Clathrocystis æruginosa.* These plants are highly nitrogenous, and their decay in the pipes causes this peculiar taste and odor. The water at the reservoir may be free from both, while the water drawn from the service-pipes possesses both taste and odor. That a bad taste and odor may be thus produced is uncontestable; but this is not a complete explanation. If the water

generally were loaded with the products of vegetable decay, even of such organisms, it would be unhealthful, but the minute quantities that produce this very unwelcome and decidedly offensive condition of the water causes no ill-health, and is objectionable from the disgust engendered by being compelled to use it. Repeatedly specimens from the reservoir were examined, and no impurities found, nor were there any found in the offensive specimens drawn from the pipes. This was the case in New London, Hartford, and other places. In some cases the reservoir in summer grows enormous quantities of water plants, which are the cause often of a bad taste. This differs from the minuter forms, and is of course more deleterious. Large collections of water plants which have a decided odor and taste *sui generis* have in one or two instances been brought to notice, and were apparently the cause, as it disappeared on their removal. This was on a small scale; a private supply, not a large reservoir. If caused by the minute algoid growth, filtration would be of no service in removing or preventing it. The growing and grown plants, alive or dead, would of course be removed, but not the spores or germs by which they are reproduced. Unless the water entered the service-pipes directly from the filtering-bed, the plants would soon reappear; but they require light and air for their production. Filtration, indeed, often removes large masses of vegetable growths, which often form a complete mat over the whole sand surface of the filtering-bed an inch or more in thickness, of course clogging the filter to a large extent. Where there is excessive growth of water plants, therefore, the water should be filtered at least in summer to remove them.

There is, it must be confessed, no complete explanation of the smell of these odors that appear in potable water, the *algæ* are sometimes the cause, but these are not always present to account for the odor. Those that do cause odors are of a bluish-green color, at times purplish or even black. The cucumber-like taste is not due to the growth or decay of plants.

COLOR BLINDNESS.

The Legislature passed an act, at the last session, requiring all railroad employees, engaged in any manner in running the trains, to be examined concerning their acuteness of vision and color perception. It was made the duty of this Board to superintend the execution of the law, and prepare rules and regulations, pre-

scribe methods in which, and the intervals at which, such examinations shall be made, and the form of certificates; in short, leaving all matters of detail to be determined by the Board. The certificates, however, were required to state that the employee possessed normal visual power and freedom from color-blindness.

As the work was in many respects novel, no State in this country ever having issued such a law; and the data as to the limits of visual acuteness compatible with safety, in railroad employees, or the compensation for defects in color perception, resulting from experience, knowledge of the road, and other standards in discriminating signals than color, *e. g.*, by the intensity of colored lights, the utmost care was used in deciding upon the tests to be employed, and those selected only that were generally recognized as decisive by all experts, and were proven by the most rigid practical tests. For deciding acuteness of vision and visual field, the methods in use by the best oculists in their practical work, in examining eyes and determining defects, were employed, having, moreover, the sanction of the International Medical Congress at Amsterdam, where were congregated the most celebrated oculists in the world. The methods of examination and tests for color-blindness were also confirmed by the same authority, and are those in use by the United States marine and naval services; in a word, the most reliable tests known.

As it was obvious that all employees did not require the same strictness in examination, two classes were formed, the first including engineers and firemen, and at first brakemen, but later these were transferred to the second class, leaving engineers and firemen only in the first class, all others in the second. It was intended to have finished the examinations and corrected any injustice, and made compensation for the counterbalance of defects by experience, etc., by the resulting data. A rule was therefore passed that in case of employees who have held their positions five years or more, the standards required in each class shall be determined by special instructions from the Board of Health. All that failed to pass the tests were to be informed that this was not final, but subject to revision, as, had the examinations not been interrupted, there would have been ample time before the 1st of October, and no one was to be dismissed until after that date.

By conference with the examiners and with the railroad officials, those that, although more or less defective under the rules, were still competent and safe men by reason of some compensating cir-

cumstances, would then have been furnished certificates, and the best results attainable under the law have resulted. Any general fact recognized during the course of the examination was at once acted upon, *e. g.*, congenital defects of vision, or the results of injuries received sometime previous, the condition of the eye having become stationary, and experience proving the capability of the employee, a special rule was issued deciding that certificates should be issued to such employees. There was, however, such opposition to the law, and so general a request for a modification and lowering of the standards, manifested by a petition signed by six thousand, as stated and apparent from the bulk of the documents, also, a resolution from the convention of both political parties, that action was taken at once in regard to old employees. The details of the examinations, the law, rules of the Board, and the like, are given at length later. The results of the examination and a presentation of the whole subject may be found in the reports of the examiners and the paper by Prof. Carmalt. It was not to be expected that any tests by which men were rejected would be satisfactory to the men rejected; and such has proven the case, as bitter complaints and appeals have been directed against the tests by flags and lanterns as against the others.

For the detection of color-blindness, Hohlmgren's worsted test is the most reliable and unfailing. When any objects, whether it be flags, lanterns, or ribbons, are held up, as there are only two colors, white being told by every one, when asked what the color is he has an even chance of guessing right if he were totally blind. In the case of old employees, other methods of recognition have been learned, so that the defect is certainly more easily condoned. As for testing acuteness of vision, the side of a barn-door might as well be used as large objects even if waved most frantically. The tests for old employees rejected by those first established was, however, in deference to public sentiment, lowered to what is called by oculists two-thirds vision, in other words, one-third less sharpness of vision than the healthy adult eye, and the fractions in class second reduced to that standard, that is, lowered one-third. With reference to new employees no changes were made.

DISEASED MEAT.

There is probably no very clear or adequate idea of the extent of diseases among domestic cattle, and especially those communi-

cable to man. Investigations upon this subject have been commenced, and the results will be given later, when the subject can be more exhaustively treated. The able paper of Dr. Cressy on the relation of tuberculosis in cattle, and the consumption of milk from cows thus affected, and its influence upon health, deserves careful and thoughtful perusal.

ADULTERATIONS IN FOOD.

Investigations in this department have been carried far enough to show that such do exist, and to a considerable extent. The most common, however, are falsifications, as meal for mustard, where a cheaper but harmless substance is used to mix with a higher-priced one, for purpose of gain. A complete report, that is, enough for all practical purposes, it is hoped will be ready for our next report. There are many adulterations that are harmless that have been used to cause a great sensation, as glucose, which is perfectly harmless, simply is less sweet than the syrup it is sold for, and cheaper. The adulteration of milk, especially that sold for infants' food in our cities, is, however, a matter of graver importance. Fortunately it is not extensively carried on. The impoverishment of the milk, especially in the summer months, lays the foundation for those digestive troubles that slay so many innocents in the first few years of infantile life. A brief account of these, and the methods of adulteration, follows.

SICKNESS FROM IMPURE ICE.

In several instances the attention of the Board has been drawn to sewage-contaminated ponds with ice-houses on their borders, and strange to say, although the evidence of disease thus caused is so conclusive, many still adhere to the idea that water purifies itself in freezing. Even the process of melting the ice and demonstrating the presence of organic pollution by the microscope, will not always convince against the force of the pocket argument. Several isolated cases of enteric trouble, and one death from the free use of ice polluted by sewage, have been reported during the year. Fortunately an enlightened public sentiment is compelling the abandonment of such sources of supply, customers insisting on knowing where the ice they buy is cut.

THE LOCATION OF NUISANCES.

There is one power that should be possessed by the Board, and that is the location of injurious trades and manufactories where they can pursue their necessary avocations without detriment to the public or private health. Much hardship and loss may fall upon well-disposed persons who are carrying on useful but dangerous manufactures. By the action of the local authorities they are justly compelled to move. It is then often difficult to secure a location. However safe and harmless to any neighboring interests such may be, if the design becomes known all sorts of legal annoyances are inflicted; meanwhile the business goes to the dogs.

The local Health Board has no power to designate such location even if it desired, which it is far from doing. A case in point: A combined tripe and bone-boiling establishment was ordered to remove, very justly, beyond the city limits. The owner applied for a location to both local and State Health Boards, as suits were threatened wherever he commenced operations. Neither could help him, although we gave the opinion very decidedly that no harm could result to any one from his new location. The power to settle the question would be of great value to both parties, setting the minds of his neighbors at rest and him from continued annoyance.

THE LOCATION OF SLAUGHTER-HOUSES.

These should be banished outside city limits unless conducted on the abattoir plan. The immense pork-packing establishments are free from odor during the hottest summer months, although hundreds of hogs are butchered daily; indeed, the estimate is low. Small establishments, if conducted separately, should be without city limits, as with ordinary care alone they become offensive during the hot months.

A case was brought to our notice of a slaughter-house located on a hill-side, a few rods from a reservoir used for collecting water as a supply for a city. It was unhesitatingly pronounced a nuisance, dangerous to health. The proximity alone did not determine this, but the slope of the bank. Had this been in the other direction the danger thence arising would have been slight.

SANITARY INSPECTIONS.

These increase in number each year, especially of buildings. It is singular how ingeniously sanitary nuisances are constructed, as

if the design were to make a bad condition of affairs. To illustrate: For several terms the water in a large school-building was considered to be contaminated, and disused, as it smelled badly whenever any was drawn from the faucets. An investigation was made. In the rear of the building was a large privy-vault twenty feet square or more, and ten to fifteen feet deep, and unventilated except by the seats, which did not afford much, the building, brick, closed most of the time. A large earthenware drain led from the sinks to this vault, and whenever the water was drawn the displaced air from this drain passed up. Moreover, whenever the wind was in the right quarter it forced a current of foul air from the vault into the building up through this drain. A trap outside and thorough ventilation of the vault by a shaft running through the roof, was advised and remedied the evils.

SCHOOL HYGIENE.

The report upon the discussions relative to warming and ventilating the new High School-house at Bridgeport, forms a valuable contribution to this subject for every city and indeed school-district in the State. The valuable paper upon the subject by Mr. Briggs of Philadelphia presents the points clearly and tersely. It is not probable that any school-building in the State will be warmed in a more healthful manner, if, indeed, any equal it. It was intended, this year, to have published a pamphlet on school hygiene, for general use, but there are several peculiarities that yet require investigation. Meanwhile, nothing of greater value could have been presented than this. The subject is still under consideration and study. Many letters of inquiry in reference to the details of construction of school-houses have been addressed to us this year, a gratifying indication of increased attention to school hygiene.

MONTHLY SANITARY REPORTS.

These reports concerning prevalent diseases, commenced the first year of the existence of the Board, have been continued and extended during the present year. Much more general reports are received, and the State is more completely represented. Some elements for comparison with preceding years have now accumulated, and we are enabled to add the death-rates since the completion of the tenth census. The zeal and interest of our correspondents continues unabated, and they deserve our warmest gratitude

for their labor of love. We now receive in exchange similar reports from London and the principal cities in England, Ireland, and Scotland, Paris, Vienna, and Rome, the National Health Board, and many States and cities in the United States. It is hoped to utilize these, during the coming year, for the benefit of the physicians of our own State.

LIBRARY.

Many valuable contributions have been made to the Library by gift and purchase during the year, not the least of which are the exchanges from other similar organizations. Our special thanks are due to the Hon. J. R. Hawley for valuable gifts. The importance of the Library to the work of the Board cannot be overestimated; also, indirectly, to other Health Boards and physicians that consult it.

POLLUTION OF STREAMS.

The discussion on the pollution of Park River, and the means proposed for its relief, together with the profile-map of the river and the sewer map of Hartford, which shows the basin of the river. The branches that unite to form it are partly shown. The stream that receives much of the sewage of New Britain is indicated. The initial portion of this is seen in the New Britain map in our second report. In its course through that city it is turned into the main sewer. This subject is further illustrated by the discussion of the condition of the stream in South Manchester that receives the sewage and manufacturing waste of that village. The importance of this subject in this State has hardly commenced realization, and as yet no action has been taken to remedy the existing evils, except in Hartford, where the plan for the relief of Park River is under consideration.

THE SALE OF POISONS.

A law was prepared on this subject last year, but as a much more complicated one was included in the pharmaceutical bill, it was not presented, to leave a clear field for that which was continued from the preceding session. The importance of the subject demands attention, and, as the bill referred to was rejected, there is now nothing in the way of the simpler law, and we earnestly advise its passage.

LOCAL HEALTH BOARDS.

We have under consideration a digest of all the laws on health, for the use of local boards. The desirability of a general revision of those laws has alone restrained its preparation. The powers, while ample enough, are so ill defined that in one case even a lawyer did not know how to call together the town board of health when action on a certain local matter was desirable. In case of small pox, perhaps, the selectman has more arbitrary powers than any despot. Not but that this is desirable, but it is exceedingly vague, and there should be no ambiguity about the organization of a town board, and its sessions for sanitary work. The powers and duties of these bodies should also be more clearly defined, and the duties of the people towards them, especially in relation to the report of malignant, contagious disease. In the cities many of these difficulties are avoided by action of the city council in forming a city board of health, uniting the two. If all the city boards could be organized on one plan, involving greater permanence of membership, more direct responsibility, and more clearly-defined duties, their work would be much easier and efficient.

THE HEALTH OF WORKERS ON RUBBER.

The valuable paper by Dr. Bartlett is the first of a series on the relations of trades and occupations to the health of those engaged in them. This is among the first studies upon this special branch of manufacture. The literature upon the subject is very meager, so that there were no other data to go by except those now collected. The paper, therefore, forms a valuable contribution to the literature of hygiene of trades and manufactures. As soon as the case will allow, the results of investigations in other fields will be given. This State, with its multiplicity of industries, affords ample opportunities for these studies.

SOME OF THE RELATIONS

OF

MODERN HEALTH BOARDS

TO THE

Material Prosperity and Wealth

OF A COMMUNITY.

BY

Prof. W. H. BREWER,

Sheffield Scientific School.

PUBLIC HEALTH vs. PUBLIC WEALTH.

The following letter of the President of the Board of Health of the City of New Haven to the Court of Common Council of that city, states so clearly a natural law of so much importance to every town in the State that it is reprinted here.

With the presentation of the last Annual Report, I called the attention of your Honorable Body to some of the functions of Health Boards in general; with this Report I will ask your attention to *some of the relations which modern Health Boards bear to the material prosperity and wealth of a city or community.*

The *first* need of civilized society is the protection of life and property from violence. Without this, civilization itself is impossible, hence it has been the first and greatest aim of all nations and communities, in all ages, and in every stage of social progress. To secure it, laws are made, penalties imposed, and all the expensive machinery of courts and officers have been devised and are supported, armies are maintained, and wars waged when necessary, for national existence as well as civilization depends upon it. In these latter days, and as an outgrowth of an enlightened civilization, along with this protection, personal liberty has been better secured, until now the importance of this ranks next to personal security from violence; but, in all times, the liberty of the individual has been held to be subordinate to the safety of the community.

In these modern times, and as matters now stand, with both of these secured, there is still another requisite for a community to be *prosperous.* Each individual who constitutes the community must not only be protected in his person, property, and liberty, but his life and health must also be protected from certain diseases and dangers whose power for evil have grown along with our civilization. For an individual to prosper by his labor, he must be reasonably well, and this is just as true of a community or a State as it is of the individual or family. The industrious laborer may

be thrifty and add to his savings year by year, if he be well; but when sickness comes upon him, and his earnings cease, then his savings go, and his property is soon eaten up. Or if he have much sickness in his family, however industrious he may be, he cannot be thrifty, for sickness is more expensive even than luxury. And this is just as true of a city or a community. In the intense competition of these modern times, no sickly community can be prosperous. It may be intelligent and moral and industrious, but it must be poor; and it is to this aspect of the importance of Public Health to which I now wish to call your especial attention.

Every student of History and of Political Economy notices the wonderfully rapid accumulation of wealth and capital in modern times compared with what it has been in previous ages. The material wealth and working capital of the civilized world has more than trebled within less than a life-time. The accumulation of wealth and property (and it is this which represents the aggregate savings from labor) during the last few years more than equals all that had been saved in all the thousands of years that had gone before, and that, too, while there has been a more general enjoyment of the comforts of life, and a much greater indulgence in its luxuries.

The nature and sources of this rapid growth has been the subject of much discussion by statesmen and political economists. The causes usually assigned are the invention of modern machinery, the use of steam as a motor, the growth of modern means of transportation by sea and land, the application of the natural sciences to the arts and industries, the spread of popular education, the diminution of wars, and the production of the precious metals.

There is no question but that each and all of these have had their influence, but there is one still greater cause which is too often overlooked simply because it is not so conspicuous. The greatest of all causes is to be found in the better average health of civilized countries, and the longer average term of life which is now secured to working men.

It was not merely war, nor because they did not have steam, nor did not know about greenbacks, that kept the masses in poverty all through the middle ages—it was disease and the death that came from disease that kept the nations poor.

With all our material resources, with all our boasted inventions, our railroads, and our steam-power, we would be as poor to-day as they were then, were disease so common, pestilence so terrible and

wasting, and the average years of a man's working life so shortened, as they then were.

The history of the middle ages is a sad succession of plagues, of cities devastated, of states impoverished, of laborers swept away in millions by successive waves of pestilence that followed each other as often as cities grew populous. Between the common sickness which was ever present and the pestilences which swept off their millions at a swoop, the average period available for actual labor in man was perhaps not more than half what it now is. Meanwhile, it took just as long to rear children to a working age as now, and sickness was just as expensive; so, between the diminished power of production, the waste by sickness, the panics and checks to commerce caused by plagues, which were raging somewhere all the time, it is no wonder that wealthy people were comparatively few, and the masses sunk in abject poverty.

If we are tempted to think that we are saved from this by steam, or machinery, or increased production of the precious metals, let us look at any pestilence-stricken city of modern times. A single pestilence of but a few months came near bankrupting Savannah, and laid a check on her progress and a burden on her resources which it will take many years to overcome. Or, worse still, Memphis with its two pestilences. And such may be the loss to any American city if it neglects sanitary laws.

Our modern civilization is one of intense competition. Each producing community is now in a struggle with all the rest of the world, as it never was before. If it have any special advantage, it may prosper; if it have any special disadvantage, it either lags behind in the swift race, or by standing still it relatively declines, or else it goes under in the hard struggle of productive or commercial competition. And what heavier burden to bear than sickness?

And yet this fact is liable to be overlooked or forgotten. The healthy man hopes that sickness will never come, and may be careless of his health; and the healthy community rarely awakens to danger until epidemic sickness sets in, and then the loss is actually begun.

It is the part of Sanitary science to point out the dangers and suggest means of prevention, and when epidemics actually set in, to suggest remedies; it is the part of Sanitary legislation to provide means to apply these remedies; it is the function of Health Boards to administer them. But from the nature of the case, the better

they do their work the less obvious are their labors. The officer who heroically stands at his post during the time of pestilence, labors to stay its dread work, helps the suffering, and comforts the dying, is a hero; and the heroism is of a kind that can be seen; no praise is too high; but the other officer, who by his labors *prevents* the pestilence, and keeps it so far off that the danger is scarcely seen, receives no such praise—too often, in its stead, criticism and opposition and indifference.

It is because of the nature of Sanitary work that its value in increasing the prosperity of a city is so often overlooked. In the ordinary pursuits of business the clang of machinery, the brilliancy of the applications of science to the arts, the bustle of business, the romantic ways in which the precious metals have been discovered and won, are more conspicuously in the eyes of the public than the quiet, persistent, unromantic but heroic fight with unseen but unwholesome influences, which lurk in the air of our towns. These malicious influences, mostly growing out of our modes of life, are ever present in all our cities, ever growing unless checked, always producing disease, and from time to time specially inviting pestilence, as persistent as sin, as tireless as nature, and as pitiless as death.

The rapid growth of town and city populations as compared with the country, during the last forty or fifty years, has been made possible only by the power which modern sanitary science gives us to prevent, to check, and to combat epidemics. As matters were before, a pestilence of but a few weeks or months would put back the growth of a city for years. This city has had but one visitation of yellow fever; it lasted scarcely two months, and from all I can ascertain by a careful investigation of the matter, it took from eight to ten years to recover from that shock. Indeed, can we say that it *ever* recovered? What New Haven might have been, had it not been for that check, just at a time of rapidly growing commercial importance, we can never know; but that citizens left with their capital to go into business elsewhere, and never came back, and that trade left the place and never returned, is certain. What "*might have been*" had this pestilence not fallen on us eighty-six years ago, we can never know; what *may be* if another pestilence comes, we know well. Too many cities have had such a bitter experience even in modern times for us to be ignorant of the effects.

We insure our manufactories from loss by fire to ensure their

being rebuilt if once burned,—even with this, the temporary suspension of the work may drive trade elsewhere. Hence premiums are cheerfully paid to guard against the possible contingency, and before the conflagration comes we cheerfully purchase fire engines and apparatus, and organize skilled men to use them when the emergency comes. Here it is recognized that all this, though expensive in the beginning, is cheap in the end; and yet how reluctantly any such means are taken to guard against a worse destroyer of our wealth and prosperity! The arguments used even by official bodies against adequate support of public health administration, in many if not most cities, are curiosities of inconsistency, and will be cited as such by the next generation.

It must not be forgotten that Health Boards are now more strongly demanded and called for because of their pecuniary importance than because of their function in allaying human suffering or saving human life. So long as merely men died, and health was lost, and sorrow fell on thousands of homes, Memphis went on as of old, dug her cesspools deeper, and more of them, and did without sewers; but when the loud voice of trade cried out, "we cannot afford to allow Memphis to longer stand as a menace to the commercial prosperity of the great Mississippi Valley," then, and not till then, was a system of sewering begun.

A high death rate means lessened vigor, lessened powers of production, a check on prosperity, a burden on industry. A low death rate in modern cities can only be secured by public sanitation, and by an intelligent and efficient coöperation of the public with an active Health Board. A single epidemic, but one-fourth as bad as that in Memphis last year, would cost this city more, and leave us with higher taxes, than the most expensive system of sewers and of garbage collection that was ever dreamed of here. *And there is nothing to prevent it except public sanitation.* We had that very disease here once, and the city did not recover its prosperity for ten years, and it lost some phases of prestige which it never regained. An epidemic of small pox a few years since lost to the city of Philadelphia, in ways which could be estimated, above twenty millions of dollars. This city a little later was seriously threatened with a similar epidemic, which was effectually stayed, and the health officials were perhaps more severely criticised for their work than for any other one thing they have ever done! The results, however, have amply demonstrated the wisdom of their action.

The fact wants to be kept before the public, that as production and commerce and trade are now carried on, few cities can afford to allow a pestilence to invade them. *And if it comes to a city with the natural advantages of soil and climate we have, it is due either to official ignorance or public neglect.* There is perhaps not a single kind of pestilence which has afflicted any civilized city of temperate climates during the dark ages, or since, over which we have not now control, if the community act up to the light and knowledge we have; and on the other hand, as business is now carried on, no city can be so afflicted as many then were, and not be bankrupted and financially ruined.

Moreover, a pestilence is only an intensified manifestation of disease; most of its disastrous effects may be produced by the less intense form of prolonged but general ill health, and it is perfectly safe to say that no northern city can be really prosperous and really sickly at the same time. The health of people is the real foundation upon which the prosperity of the city and the wealth of the community depend.

The money value to New Haven of a reputation for healthfulness should not be slighted or under-estimated in our efforts to maintain our beautiful and our beloved city, and no one single fact will do more to foster and maintain our material prosperity than to continue to have "the lowest death-rate of any seaport of its size in the world."

ON THE MANUFACTURE

OF

INDIA RUBBER GOODS

AS RELATED TO THE

HEALTH OF THE OPERATIVES.

BY

WALTER R. BARTLETT, M.D.,

NEW HAVEN, CONN.

MANUFACTURE OF INDIA RUBBER GOODS.

In compliance with the request of the Secretary of the State Board of Health the following brief investigation of the above subject has been undertaken and the results are here submitted. The manufacture of rubber boots and shoes, as well as other rubber goods, is carried on to a large extent in the State of Connecticut, and in New Haven particularly there is located one large establishment employing from five hundred to one thousand hands, and is known as "The L. Candee & Co." Taking this as a representative concern, and one in which the business is well exemplified, I will here give the process by which the work is there conducted. The crude rubber is designated as Para and Africa rubber, names derived from the respective localities from which it is obtained. The Para rubber comes in large ovoid masses, weighing several pounds, amber colored, of a uniform consistency, and free from odor, while Africa rubber comes in small bits, more or less adherent together, and is of a strong odor. It is not used as much as the Para rubber, not being considered to be as eligible for working as that. The first process through which the crude rubber passes is that of grinding, (the Africa rubber having first been cleansed by soaking in large tanks of water prepared for the purpose,) that is, it is passed between large iron rollers running closely together, from which it comes in sheets. This takes place in what is called the wash-room. These sheets are then transferred to the drying-room, where they are hung up until dry, for a period of three or four weeks. They are then transferred to the grinding-room, and there passed through another set of rollers which reduces them to semi-transparent sheets of uniform consistency; they are then rolled up into large masses, when they pass, while soft, to the mixing-room, where they receive the chemical compound which gives them the dark color of rubber as it usually appears. This compound is composed of lamp-black, whiting (carbonate of lime), sulphur, litharge (oxide

of lead), and tar, and is poured upon the rubber as it passes slowly through sets of rollers, and thus becomes thoroughly incorporated with its substance. From these the sheet is transferred to other rollers, where it is stamped and variously treated, with reference to its future use in the manufacture of the shoe; then it passes to the cutting-room, where it is cut out according to the pattern stamped upon it; then it goes to the cement and varnish-rooms, where the shoes or boots are put together and varnished; from there the goods pass to the drying-ovens, where they are thoroughly dried, at a high temperature, in a room specially arranged for the purpose, when they are ready to be packed for market. Such is an outline of the manner in which the caoutchouc, or crude rubber, is transformed into marketable and useful goods, and the question now comes up, are there any dangers to health connected with such manufacture? Practical experience has shown that such dangers do arise. As we have shown, the only rooms in which chemicals are used are the mixing, the cement, and varnish-rooms. In the other rooms the only source of danger would be from dust or from impure air from lack of ventilation; the former cause is necessarily, in a great measure, eliminated, as dust is highly detrimental to the finish and appearance of the goods, and in the grinding process water is freely used. The chemical compound used in the mixing-room then furnishes the source of the dust which arises, while the remedy for defective ventilation is obvious. The chief causes of danger to health then lie in the chemical compounds, and as has been stated, the mixture which is used in the mixing process contains litharge or lead. It is this which produces the harm, the other ingredients being comparatively harmless. Lead, it is well known, may be absorbed into the system through the respiratory organs and through the skin, or it may pass into the stomach; in all of these ways it reaches the system in these instances. As the mixture is poured upon the rollers the dry dust arises, and the workman, as he stands over them, receives it into his mouth and respiration, and upon his skin; this is absorbed, and in time sufficient lead is introduced into the system to produce the symptoms of lead-poisoning, viz.: sickness at the stomach, disordered digestion, and finally colic, and in some extreme cases paralysis of the extensor muscles, while in some cases the symptoms are general debility and prostration of the system at large, both nervous and muscular, with feebleness of the pulse, neuralgic pains in the legs and arms, and in some

cases albuminuria occurs. The other chemical likely to produce harm is found in the cement and varnish-rooms. With the above company the process of cementing and forming the shoe upon the last is carried on largely by females, and likewise the varnishing process; the cement is composed of rubber, dissolved in benzine. Of course the cement-room is thus filled with the odor of benzine, while the adjoining varnish-room is likewise filled with the odor of varnish, which also contains benzine. Here lies a danger to health. It is reasonable to suppose, and the fact has been observed by the writer, and by physicians with whom he has conversed, that the female operatives who work in these rooms are subjected to various disorders of the general health; the symptoms are those of disordered menstruation, dysmenorrhœa, in some cases menorrhagia, a general debility, sickness at the stomach, and disorders of the nutritive functions in general, dyspepsia, and even phthisis, has been thought to have been superinduced in this way, as a consequence of lowered vitality. Another point not to be overlooked in this connection is the effect of the pressure of the last upon the chest in forming the shoe, especially in the case of those who have not reached man or womanhood; this, long continued, tends to produce contraction of the chest, and consequently phthisis may be superinduced.

Another large establishment is located in Colchester, and employs from five hundred to nine hundred hands. Drs. S. E. Swift and S. L. Chase have kindly answered my inquiries as to their experience in reference to the matter, and both mention lead poisoning in its various forms as being of common occurrence. In addition Dr. Swift speaks of urinary disorders of "greater or less severity" as occurring, attributed by him to the benzine, which readily yielded to treatment if the patients left the mill; while Dr. Chase has had a suspicion of a tendency to Bright's disease among the operatives, but has not fully verified it. Dr. Meers of Naugatuck, where a large factory is also located, has also seen several cases of lead poisoning from the same cause. Such being the dangers incident to the occupation, what are the remedies? With reference to the chief danger to health, viz., lead poisoning, there should be first free and complete ventilation of the mixing and grinding-rooms. It would be better even if the mixing-room could be completely disconnected from the others, either being located in a separate building, or else having no communication with the other rooms except through an open

air passage-way. Secondly, the operative should be of temperate and cleanly habits, being careful to keep his hands well washed before eating, while daily bathing of the whole person is also important; his bowels should be kept regular, and in short the whole hygienic regimen should be observed. Intemperance is a powerful predisposing cause to lead poisoning from the lowered vitality of the system which ensues, and a very large proportion of those affected are victims of this habit; the remedy for this is obvious, strictly temperate habits. The wearing of respirators might be advisable in some cases.

With reference to the danger arising from the vapors of the cement and varnish-rooms, here again ventilation, thorough and complete, is the great desideratum. With the "L. Candee & Co." these rooms are large and well lighted, with plenty of provision for ventilation by the windows at least, and it would seem that the danger there might be easily reduced to the minimum; yet the fact that it does exist should be well recognized, and guarded against accordingly. As relates to the pressure of the last upon the chest, those of mature years should be employed in this work as far as possible, or the operatives should be taught to avoid this habit, as I am informed that it is not necessary to do so, or as recommended by Dr. Swift, "An oval convex shield of thinnest sheet-iron covered with leather, and fastened by a belt around the body to rest the last against, the convex portion presenting a broad surface to the last," should be worn, which would tend to relieve the chest from undue pressure. In closing, I would express my obligations to the officers of the "L. Candee & Co." for courtesies shown me in the pursuit of my inquiries, and a ready willingness to aid me in my investigations.

SECRETARY'S REPORT.

The past year has been one of unusual activity in many respects. The amount of direct sanitary work that devolves upon us is constantly increasing, both in special investigations, the study of the causes of disease, analytical work, and correspondence, especially in the answering letters of inquiry concerning almost every department of sanitary science, both domestic and public hygiene. These are very gratifying evidences of the increasing attention to sanitary subjects throughout the State. There have also been many extra sessions, arising from the extra duties involved in the color-blind law, the execution of which devolved upon this board.

The increasing demand for copies of our report, while it is very gratifying, is also in one sense a matter of annoyance, as the demand by far exceeds the supply. Out of the thousand copies printed seven hundred or more are required by the Comptroller for the supply of the legislature and other officials, so that it is impossible to half supply the demands for our second report.

This has been also well received abroad, and we were favored by the German government with a request that copies be sent to the President of the Department of Statistics at Berlin. Also by a special recommendation of our report to the Governor of New York, by an eminent sanitary authority of that State, as containing elements worthy of imitation in forming a State Board of Health in New York. We ought to have a sufficient number of copies, so that every physician and clergyman in the State, at least, might be supplied, instead of only now and then one. It would add greatly to the accuracy of our registration returns if every physician received a copy, and thus could see the effect of their deficiencies in the reports from their own towns.

The first subject that engaged attention was the appearance of small pox in December. Instructions concerning its management were issued, which are here epitomized and gathered together for general distribution.

Allusion has been made to the sanitary surroundings of the Portuguese settlement. Although sanitary surroundings have but little, if any, effect upon a disease like small pox, so far as prevention is concerned, it is true that the reverse condition adds much to its malignancy, favors its spread, and renders an epidemic possible by furnishing the proper aerial conditions for preserving and transmitting the virus of the disease. The condition of the whole neighborhood evidenced the greatest carelessness in regard to the most essential requisites for health. Privy-vault, sink-drain, and well were often in close proximity. In some instances the sewage infiltrated the cellar walls of the dwelling-houses, which stood on lower ground. Pig-pens, hen-coops, and the lairs of other domestic animals were scattered around thickly, and in what might be called picturesque confusion. The overcrowding in relation to small pox is, however, much more dangerous an element than any other unsanitary condition, as infection often takes place before the patient can be isolated. The importance of the prompt report of a case of malignant contagious disease to the health authorities demands a revision of our laws, that the duties of householders may be more clearly defined, as well as the exact powers and jurisdiction of the authorities. There is vague power enough already. What is requisite is an exact statement of the duties on both sides, and a little more discretionary power conferred upon health boards as to the time when convalescents and attendants upon such cases shall be allowed to mingle with the public, children to attend school and the like. This latter is fully as important in scarlet fever, as in that case the patient carries about the germs of the disease for some time after convalescence is established.

Isolation, disinfection, and thorough and complete vaccination of all unvaccinated and unprotected persons, that is, those that need revaccination, were the means used to control this outbreak. This vaccination was thoroughly carried out, and especially of the school children. It is advised that a certificate of recent vaccination, or of reasonably safe protection from a former successful vaccination, be required of every new pupil before he is allowed to attend school. This may be obtained from the family physician, and provision should be made so that those that prefer could obtain such certificate, free of expense, from the town physician, or one of the Board of Health. The following, including the description of the pest house, contains ample instruction for contending with

outbreaks of this disease. It is, indeed, only by neglect of vaccination that its existence is continued.

Small pox is one of the most contagious diseases. One attack usually protects the person from the disease subsequently, but is not so efficient as vaccination. The disease is due to a specific contagion conveyed from person to person, by actual contact, by infected clothing, bedding, rags, paper, or from any articles infected, and by the discharges from the pustules or the crusts that form upon them. The case should be isolated as soon as recognized.

During his illness the patient infects the clothing he wears, his bedding, and more or less the articles in the room. All the rags and the like used in the care of the patient directly during his sickness should be at once burned. Infected articles, if left to themselves, preserve their infectiousness for a very long time.

The interval of time from exposure to attack is ten to fourteen days. As vaccination works quicker (Hart, eight days), there is often time to avert the disease by immediate vaccination. In preparing the room to be used, all unnecessary articles of furniture, and especially carpets and woolen goods generally, should be removed. The bed should be so placed that the attendant can pass entirely around it. The room should be as far as possible isolated from the rest of the house, and be well ventilated.

Disinfectants should be freely used. If the room is unavoidably near others, a sheet wet with the zinc solution, No. —, may be hung upon the door. Attendants should be as few as possible, and should avoid intercourse with unaffected persons.

All persons known to be sick with the disease should be carefully and completely isolated from the public, and the case reported to the Board of Health at once, and their directions followed. Unless the disease become epidemic and general, direct contact with some infected article is necessary in order to communicate the disease. The exhalations from the patient and the products of the disease may charge the air about, for a limited space, but with proper care and prompt isolation there need be no infection, and the first case be both first and last.

VACCINATION.

As a rule, one successful vaccination in childhood protects until about fourteen to sixteen years of age. If, however, there be epidemics of small pox near, or the danger of exposure great, the

process may be repeated oftener, as there can no harm result, as no effect will be produced if the person be already protected by the previous operation. One trial, however, in face of danger, is not conclusive, and care should be taken that the operation be thoroughly performed. The following summary is condensed from "Hart's Truth About Vaccination," mainly, and is the result of the labors of a special commission appointed in England to thoroughly investigate the whole subject. Credit is here given to avoid quotation marks.

1. Small pox, in its natural state, is one of the most loathsome and terrible diseases, attacking a whole population indiscriminately and killing a very large proportion of those it attacks.

2. Those that recover remain for life disfigured, are often left consumptive, weakly, or maimed, and may wholly or partly lose sight or hearing.

3. *The character of small pox, uncontrolled by vaccination, remains the same, as shown by its present mortality among unvaccinated persons.* The statement is often made that this disease has lost much of its violence, but the statistics of the unvaccinated victims tell a different story.

4. Vaccination does not endanger life or health, but does completely exhaust the susceptibility of the system to small pox, in the vast majority, when properly performed.

5. The objections have no foundation in fact, and are disproved by all the evidence on the subject; nor does it render the person more susceptible to other diseases.

In England, the small-pox death-rate has decreased one-half since the introduction of compulsory vaccination. In many cities, where periodical inspection of all the schools and house to house visitation, with free, though not compulsory, vaccination, takes place often, the disease is hardly known unless imported, and then never becomes extensively prevalent, but is at once stamped out.

6. The number of persons efficiently vaccinated or successfully revaccinated, that are attacked even during an epidemic, is very small; and where the vaccination has been imperfect the disease is usually greatly modified in severity.

7. When successful vaccination and revaccination has been done, the proportion of deaths to attacks is but one-seventieth part of that in unvaccinated persons. By universal revaccination small pox has been stamped out of the army and navy. Experience

here shows that one successful revaccination in an adult is sufficient (England).

8. Unless there be immediate danger, only persons in good health should be vaccinated. Care should be taken in children that they have no skin disease, nor recent exposure to measles, scarlet fever, or erysipelas. By neglect of the latter precaution much undeserved opprobrium has often been cast upon vaccination. Take care that the vesicles are preserved uninjured, and avoid a premature removal of the crusts. In family practice an accurate registry of the results of each vaccination should be kept. Lymph from revaccination is worthless, and in general that many removes from the bovine loses its protecting power.

In many places bovine virus only is used, but with ordinary care humanized virus is safe, the chances against it infinitesimal.

9. Keep instruments used for vaccination clean and bright, and always have water and a towel handy, to cleanse the instrument before using a second time, even in the same family. A small scalpel or tentomy knife is better than any patent or spring contrivance, as it is easily kept clean and free from rust or stains.

DISINFECTING.

Clothing and bedding may be disinfected by intense heat, but the better way is by burning sulphur in the room. All woolen articles, mattresses, bedding, and the like used about the sick, may be disinfected by burning sulphur after tightly closing the room. Place the sulphur in iron pans supported upon bricks placed in tubs containing a little water, set it on fire by means of hot coals, or a few spoonfuls of alcohol.*

Carpets are best left on the floor, but after fumigation should be taken up and well beaten. After fumigation the articles should be placed in the open air and sunlight and beaten. Other articles may be hung up losely.

It is better to burn all articles of clothing or bedding, but if this cannot be done, the following solution may be used:

Sulphate of zinc, four ounces, and common salt two ounces to a gallon of water. Half this strength of solution should be used to boil the articles in.

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* Eighteen ounces for each thousand cubic feet is shown to be necessary by the recent experiments of the National Board of Health. For larger or smaller rooms use proportionate quantities.

Linen and cotton articles should be placed at once in the solution.

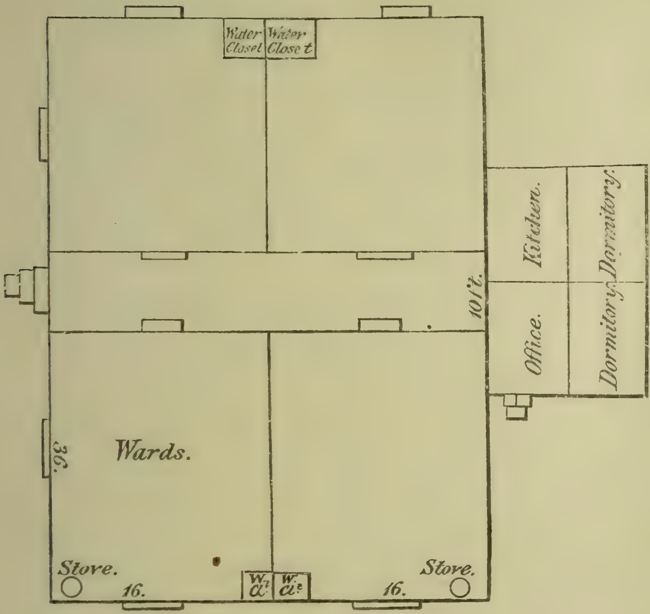
Sulphate of iron $1\frac{1}{2}$ pounds to a gallon of water. This should be placed in all vessels used to receive the discharge from the patient, and poured down sewers, privy-vaults, etc. Chloride of lime and carbolic acid are not recommended. In case of death, the body should be wrapped in a sheet dipped in a zinc solution of double the strength of the above, and buried at once.

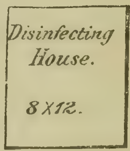
Chloride of zinc, one part (Burnett's Fluid,) to 200 of water, destroys all bacteria and may be used for woodwork or for linen and cotton goods.

PEST-HOUSE.

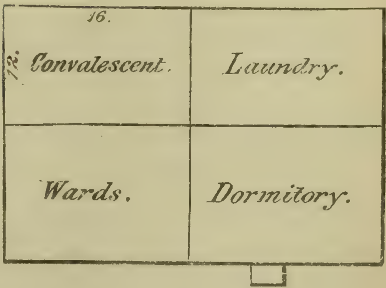
This should be of one story only. On the plan there are four wards, separated by an entry through the middle of the building. Opposite this is an ell containing an office or reception-room and dormitories for the attendants. If stoves are used to heat the wards, a ventilating-shaft may be run near the chimney, terminating in a cowl or similar arrangement. The wards should be thoroughly ventilated, the method varying with the method of heating.

Near by a disinfecting chamber may be built to disinfect bedding, etc., by sulphur. This is almost indispensable, as here the bedding cannot be destroyed after each case. Beyond this is a convalescent ward, and a laundry and diet kitchen with dormitories. This makes a complete establishment. Where the number of patients is likely to be small, the first building may be adapted for all uses by a little modification. Two of the rooms on one side may be used as wards, one on the other side as a convalescent ward, and the other as office and reception-room. The rooms in the ell might then be used—one as kitchen and laundry combined, the others as dormitories for attendants. In many cases several neighboring towns might combine and use such a building jointly, as cottage hospitals are managed in England, where large establishments are impossible. This plan provides for complete isolation of patients and attendants, supplies having been laid in previously. Iron bedsteads and wire matresses that can be painted, and thus easily washed and cleansed, are the best. The laundry should be provided with a set kettle for boiling clothing in the disinfecting solution.





Plan for
PEST HOUSE
or
SMALL POX
HOSPITAL.



ADULTERATION OF MILK.

In many instances we have been called upon to examine specimens of milk where adulteration was suspected, or where the milk used as food for infants was not digested, and did not appear to nourish. In quite a number of cases the milk was clearly adulterated; the closest imitation found was where a dilute mixture of starch and water was added to the milk in large quantities, the specific gravity being preserved. Some substance of a mucilaginous nature was also added in very small proportion to prevent the starch from settling; in spite of this on long standing the lower portions of the milk were thicker than the upper. This was not very noticeable however, until the second day, it being supposed that the whole quantity would be used for one day's supply, which in fact was the rule. This thickening was not very apparent unless the milk were placed in a glass bottle. The lactometer here would be useless, as the same specific gravity is preserved. Infants cannot digest starchy foods until they are old enough for a mixed diet, and their ability is in inverse ratio to their age, that is, the younger the child, the less power has it to digest starch. As artificial feeding of infants is so largely depended upon, especially in cities and towns, the importance of this adulteration is very great. The milk is thus robbed of its health and life-giving properties, and so much rubbish added which the comparatively weak organs of the child are called upon to get rid of, and as a natural consequence diarrhœal troubles ensue, the starch acting as an irritating foreign matter. As the milk for young infants is largely diluted with water before it is used, the importance of pure milk to start with is correspondingly increased. In several instances where the milk was said to disagree, this starchy admixture was detected. The milk can easily be tested for starch if a drug store is accessible, or in the country every physician would probably have the materials. Place an ounce or two in a tin cup, boil a few minutes gently, then transfer to a glass tumbler previously warmed, add a few drops of muriatic acid (any strong acid will answer), stir, strain, and cool, add to the whey two or three drops of the simple tincture of iodine; if there be any starch present a deep, blue color will appear. The acid sets the iodine free, which unites with the starch to form the blue color.

The adulterants used are quite numerous. between ten and fifty

per cent. of water it is estimated is often added to milk; in this way the milk often becomes infected with the germs or virus of typhoid fever and other zymotic diseases; the instances are only too common. Prof. Chandler estimates from numerous investigations that to the milk sold in New York one-quarter water is added. In many instances all the families supplied by a certain milkman have been attacked with typhoid fever, as near Glasgow, Scotland, in 1872–3, and in the suburbs of London 500 cases were thus caused. Diphtheria also has been thus distributed. Chalk, flour, and various decoctions as of barley, for instance, are largely used, sugar and gum arabic, salt and various coloring matters, gelatine and isinglass, to thicken and preserve the specific gravity. The most peculiar adulterants *said* to be used are the brains of domestic animals pounded fine, thinned with water; the latter we have never seen,—instances are given, however.

The microscope here becomes a valuable aid in detecting many of the foreign substances, also in determining the relative richness of the milk. Even if the adulterants are not identified by it, there is no known method by which the fatty corpuscles or globules in the milk can be imitated, and if these are very much decreased, the milk can be declared thin and poor, unfit for the nourishment of infants. The specific gravity is not a reliable test, as most milkmen who adulterate milk have a lactometer and bring the milk up to the standard of pure milk which should never be below 1,029, at 60° (Fahrenheit) temperature. With ordinary samples of pure milk more than ten per cent. of water can be added before the specific gravity is reduced below 1,029, as shown by Prof. Chandler's investigations.

Chalk can be detected by adding water to the suspected milk, placing it in a test-tube or glass bottle, and allowing it to stand awhile. The chalk will settle. Carefully decant, then add a little muriatic acid to the sediment—effervescence shows the presence of chalk. Flour and starchy decoctions can be detected in the manner already described for starch. The other substances require more complicated tests. Water, which is by far the most commonly used, is most difficult of detection unless it exceeds a certain amount; except as before indicated it is harmless, the only other detriment being the impoverishment of the milk, and the reduction of its nutritious value. The principal adulterations found have been starch, lime-water, chalk, flour, various gums, bicarbonate of soda and salt, and, of course, water. The use of these, for-

tunately, is not common in this State—perhaps we must except water in this statement—but it is well to know how to detect those most ordinarily met with.

ADULTERATION OF FOODS.

The work in this department is not yet complete. It can, however, be said that while no doubt adulterations do exist, they are not found in anything like the alarming proportions stated by sensational writers. The greater portion of those found moreover, are of a harmless nature, and are substitutions of a cheaper substance for one more expensive, as turnip grated for horse-radish, meal for mustard. The ground coffee is in many cases known to be a mixture; the adulterants are usually harmless; the only danger in using rye is, of an admixture of ergot—instances, not in this country however, have been given of sickness thus caused. The various matters that are used in the manufacture of candies are not all of them harmless, nor is the terra alba used in the cheaper grades of chocolate creams and the like, recommended as an aid to digestion. Large quantities of glucose syrups are sold and glucose sugars; the only detriment is they are not as sweet as the sugar cane syrups. Sorghum syrup is largest glucose, but has never been considered unwholesome. The law passed at the last session concerning the sale of glucose is entirely uncalled for. Fortunately no attempt has ever been made to enforce it. It should, however, at once be repealed, as it might be used maliciously. The sensational reports concerning tin in sugar and syrup have never been shown to have any basis in fact, by the tests we have made.

DOMESTIC POISONS.

Repeated instances have been brought to notice of sickness resulting from the use of arsenic in various trades and manufactures. In places where the arsenic is liable to be diffused as a fine dust, it is advised that some form of respirator be used; the respirator vail of Dr. Browne is light and easily worn. Of course, in work in-doors, the only portion used would be that covering the mouth and nose.

Lead-poisoning, from the use of lead pipes to convey spring water long distances, is occasionally seen. The use of galvanized-iron pipes can be safely recommended, as the most careful study has failed to show any dangers from zinc-poisoning, which was urged as an objection to their use. Where the fumes of lead are

to be encountered, the use of a respirator is also advised, as well as a hood with a heated pipe opening into the air outside the building, to convey away the fumes. The use of melted lead in tempering steel, etc., is quite extensive in this State; unless careful precautions are taken lead-poisoning invariably occurs sooner or later. The danger to workers in rubber from this source is described by Dr. Bartlett, and the precautions to be used. Several cases of poisoning from copper, resulting from the careless use of acids in connection with brass utensils, have been reported. Usually the compounds of the fruit-acids with copper are so astringent that their presence is at once detected; rarely except in the case of pickles, perhaps, is danger to be apprehended from this source. In lead-poisoning the cases of sickness resulting from the use of canned goods where the acids, etc., had acted upon the lead of the solder, in one instance a large lump had fallen into the can, and was thus directly exposed to such action. For the most part, the utmost care is shown by the manufacturers of such goods to prevent any such accidents; too great care, however, cannot be exercised.

SPECIAL INVESTIGATIONS.

Reports of these will be found in more extended papers later. In many instances dwelling-houses and some institutions have been examined. One peculiar defect is worthy of notice, as sickness of a typhoid character had been very prevalent; similar defects have also been found in private houses. On the first-floor in the center of a long narrow hall from which opened sitting and sleeping rooms, was a water-closet, trapped, of course, but the soil-pipe unventilated; through this closet passed a large tin pipe from the furnace conveying heat to the rooms above; the register-box as usual, larger than the pipe, ventilated this water closet, which was often used, into the room above. This room was used by children during six to eight hours of the day; bad odors had often been complained of by the occupants, but, as usual, no effort was made to trace them. The closet was ordered to be removed and in its new place the soil-pipe ventilated. Too often we find long waste-pipes running nearly horizontally, and often along the course of hot-air pipes, or beside furnaces, so the air in them is constantly rarified, and an upward draft induced.

Another sanitary defect worthy of note that has resulted from these special investigations, is as follows: Nearly all the waste of a large institution was carried to a large pit outside the main

walls—the laundry and kitchen waste, and that from the water-closets used by several hundred inmates. This was trapped as the man-holes by the sides of the streets are trapped. It was, however, closed hermetically, and of course constantly filled with the vilest gases of decay, as there was a sediment several inches deep at the bottom. As the air was here confined, whenever there was a large admission of wash into the pit, the foul air was forced through the traps into the buildings. This was ordered to be ventilated by a six-inch shaft running to the roof, and surmounted by a cowl; shortly afterwards in repairing the roof on washing-day, the workman stated that the steam could be seen pouring out of this pipe, and the odor was distinguishable several feet distant—good proof of its work as a ventilator.

SCHOOL HYGIENE.

Attention is here called to the valuable report of Mr. Robt. Briggs of Philadelphia, which discusses the whole subject of the ventilation of school-houses. As but few copies of this were printed, as well as from its intrinsic merits, we determined to republish the whole report, and our thanks are due to the author for his kind permission. As so many points of detail in the sanitary construction of school-houses were included here, we asked the architect of the new high school building, Mr. W. Richard Briggs of Bridgeport, to write out in full, a description of the plans, and for illustrations to accompany it; the paper discusses wisely and well many points in the sanitary construction of school-houses, and will be of permanent value.

TENANTS.

The following card furnished by the Dime Savings Bank of Norwich to all their tenants, is printed, as illustrating the interest in sanitary work in this State:

Compliments of Dime Savings Bank of Norwich—Tenants who wish Healthy Houses will please read, and follow these hints.

Water and fresh air are the chief defense against disease. Whatever else may be applied to unclean things, infected clothing, foul places or unhealthy houses, these two purifiers must be so applied as to make every part clean and fresh. Boiling water and strong currents of air will speedily remove all mouldy, slimy, and musty conditions and bad odors that are common in houses, closets, etc. The scalding water may be applied with a stiff wiper

or mop, and the currents of fresh air should be so turned on through open doors and windows as to ventilate through and through.

Wet cellars, damp rooms, and all dark places will breed mould and fungus growths, which make the air offensive and unhealthful. The remedies are: Light, air, and thorough drying.

Let there be the least possible waste and garbage, yet it is easy, with the help of disinfectants, to keep all kinds of refuse matter in such manner that it will not be offensive before its removal. For want of a little care many a valuable life has been lost through the putrid emanations of a few vegetable or animal matters in cellars and store-rooms. Even decaying wood and sawdust are very unwholsome.

Disinfectants are not substitutes for cleanliness and the use of water, light, and air; but they are useful for things and places which cannot be at once cleansed and ventilated so thoroughly as to prevent decay, disease, and infection.

The following simple rules will be found useful and inexpensive:

1. To absorb moisture and putrid fluids, use fresh stone lime finely broken; sprinkle it on the place to be dried, and in damp rooms place a number of plates or pans filled with the lime powder. To absorb putrid gases, charcoal, fresh and dry, should be combined with the lime; this is the calx powder sold in shops, but any one can easily prepare it.

2. To destroy putrid effluvia and to stop putrefaction, use chloride of lime, as lime is used in the above. Occasionally pour upon the plates some strong vinegar and add more of the chloride.

3. To disinfect privies, cess-pools, drains, and especially vessels and places in which refuse or discharges from the sick are cast away, use copperas—dissolve ten pounds of copperas in five gallons of water, stirring it briskly to make a complete solution. Pour a pint of this solution every evening into every water-closet, pan, or privy-seat, and rinse out every receptacle for swill. To disinfect masses of filth, privies, cess-pools, etc., gradually pour in the solution hour by hour till every part of the mass or foul surface has been thoroughly disinfected. Let a small quantity of this solution be constantly kept in all vessels into which the discharges from the sick are voided, and let every privy or place where the discharges are cast away be thoroughly saturated with the disinfecting fluid. The above solution is still more effective if a pint

of the very best fluid carbolic acid is added; but this is somewhat expensive and has a strong odor.

4. To disinfect clothing, use a solution of four ounces of sulphate of zinc and two of common salt in a gallon of water. All clothing from the sick should be packed in this solution till it is boiled in the wash. The solution is colorless, and produces no stain.

This is not printed because all its recommendations are endorsed, but for the reasons before stated. Chloride of lime and carbolic acid are not recommended as disinfectants, they are both offensive, and the latter useless, unless very much stronger than can be conveniently used.

TOPOGRAPHICAL MAP OF THE STATE.

In studying the local causes of diseases, the need of accurate knowledge of the topography of the region is keenly felt. As far as our limited resources permit, we endeavor to supply this deficiency. A measure for a survey of the State was introduced at the last session and continued to this, where it is most earnestly hoped it will meet favorable consideration. The work will be of permanent value in many other aspects besides the sanitary one; indeed it is strange that the work has been delayed so long.

DISEASES OF DOMESTIC ANIMALS.

The importance of diseases in domestic animals is beginning to be generally recognized, but as yet no action commensurate with the necessities of the case has been taken. The discrimination against American exports has aroused tardy attention to the subject of the preservation of health in domestic animals, and the prevention of disease. It is, however, with those diseases that are communicable to man, that we, as sanitarians, are more directly interested in, while appreciating the gravity of the whole subject. As will be seen by the accompanying registration report, a death from glanders, communicated from animal to man, occurred in Waterbury. The horrible features of this disease when thus communicated, and its incurability, renders every means for its suppression desirable. Direct power to kill all infected animals should be given to the Cattle Commissioners, and provisions made for immediate burial and slashing the skin of the animal, to render it worthless, and prevent its becoming in turn an agent for the spread of disease. The protection of uninfected stock, and

the importance of stamping out the disease at once, demand prompt, decisive action, as would be taken in cases of venomous reptiles. The list of communicable diseases is somewhat formidable—some of the most important are as follows:

Glanders and farcy in horses, etc.

Rabies in dogs and cats, etc.

Malignant anthrax in all domestic animals.

Tuberculosis in all domestic animals.

Small pox in chickens and pigeons.

Trichinosis in swine, and other parasites.

Favus in cats, etc. (*Tinea favosa.*)

Tape-worm in cattle, sheep, etc.

Malignant pustule (*anthrax*), is not very common in this country, but unrecognized cases in butchers, tanners, and others exposed to this contagion, doubtless occur. The symptoms of several obscure deaths that have been recounted, strongly favor this supposition. In San Domingo, 15,000 men died in six weeks from eating beef thus diseased. Fortunately, this disease is extremely rare. Tuberclosis is discussed in the essay of Dr. Cressy, to which particular attention is directed. It is a singular fact that in some parts of Europe, small pox is so common in pigeons and poultry as to be a nuisance. As yet no reports have been made in this country. The importance of trichiniasis is generally understood; fortunately, thorough cooking destroys this parasite. The field for study in this somewhat unknown field is large, and the results promising, in illustration of the causation of disease. The report of Prof. Law to the National Board of Health discusses this subject very fully in the Bulletin of July 24, 1880.

VISUAL POWER AND COLOR-BLINDNESS.

Reference has already been made to the color-blind law. The following is the detailed history of the examinations, except the results, which will be found in the reports of the examiners. The following letter of inquiry was addressed to the President of every railroad in the State, and every facility was afforded, without exception, either as detailed in the letter, or in some manner as satisfactory. The succeeding documents explain themselves. The testimony is that of men, for the most part, prominently connected with railroad interests, who came either voluntarily or otherwise on the part of the employees. No witnesses were summoned by the Board. The argument of Judge Wright was upon the interpretation or construction of the law, and many of the points were afterwards used by witnesses, or contained in papers subsequently submitted, so it is not given here. The general interest in this and other States on the subject, induces the publication of the stenographic report in full.

Dear Sir:—In accordance with an act of the last legislature, we have nominated two experts to examine railroad employees for acuteness of vision and color-blindness. Before making final rules we desire to learn from all the railroads what facilities can be obtained to render the execution of the law as easy as possible. What we especially desire is free transportation for the examiners, who work singly, whenever engaged in this work. Also such clerical aid in filling out the certificates with name, age, and description of employee, either before the examination commences or while in progress, as shall expedite business. The use of an old passenger-car is a convenience, and attached to the pay-car when possible.

By order of the Board,

C. W. CHAMBERLAIN, *Secretary.*

The following is the circular of instruction containing the law and the rules of the Board.

ACT OF LEGISLATURE REQUIRING EXAMINATIONS.—RULES AND REQUIREMENTS OF THE STATE BOARD OF HEALTH.

Be it enacted by the Senate and House of Representatives in General Assembly convened:

SECTION 1. The State Board of Health shall prepare rules and regulations for the examination and re-examination of railroad employees in regard to color-blindness and visual power, prescribing the method in which, and the intervals at which, such examinations shall be made, the maximum fee to be charged for each examination, the form of certificate to be issued by the examiners, and such other regulations as said board may deem necessary. Said board shall send a copy of such rules and regulations to every railroad company and trustee operating a railroad in this State, on or before the first day of July, 1880. Said board may from time to time make such changes in said rules and regulations as they may deem best, and communicate the same to said companies and trustees. Said board shall annually, in the month of May, recommend two or more medical experts to make the examinations above referred to, and the Governor shall annually, on or before the first day of July, appoint not less than two medical experts, any one of whom shall be authorized to conduct the examination for color-blindness and visual powers, and issue certificates in accordance with the rules of the Board of Health.

SEC. 2. On or before the first day of October, 1880, every railroad company and trustee operating any railroad in this State shall cause every person in their employ as locomotive engineer or fireman, train conductor or brakeman, station agent, switchman, flagman, gate-tender, or signalman to be examined at the expense of the railroad company by one of the examiners to be appointed by the Governor in regard to color-blindness and visual power, and shall cause a like examination to be made of all persons employed after said date in either of the capacities named above, and shall cause re-examinations to be made in accordance with the rules prescribed by the Board of Health.

SEC. 3. Any railroad company or trustee operating any railroad in this State employing, after the first day of October next, in any of the capacities specified in the second section of this act, any person who does not possess a certificate of freedom from color-blindness and possession of normal visual power, duly issued in accordance with the provisions of this act, or knowingly employing in any of such capacities any person whose certificate has been revoked by the examiners, shall for each and every offense be punished by a fine of not less than two hundred nor more than one thousand dollars.

Approved, March 25, 1880.

RULES FOR EXAMINATION OF RAILROAD EMPLOYEES UNDER PRECEDING ACT.

RULE 1. All Railroad Employees requiring examination under the law of March 25, 1880, shall be divided into two general classes.

Class First shall include Engineers, Firemen, and Brakemen.

Class Second shall include Train Conductors, Station Agents, Switchmen, Flagmen, Gate-tenders, and Signalmen.

RULE 2. Certificates shall be given for each position in accordance with the succeeding rules for examination. Promotion from one class to the other requires re-examination and certificate.

RULE 3. Re-examinations shall be made: 1st, after any disease of the eyes; 2d, after injuries affecting the head or eyes; 3d, after any disease or trouble of the brain, and after long-continued illness, as typhoid fever; 4th, after mistakes or acts which call in question the visual powers; also, whenever directed by the Board of Health.

RULE 4. The examiners shall report regularly to the State Board of Health, and their work shall at any time be open to the inspection of any member or members of said Board.

RULE 5. The regulations for conducting the examinations and the standards for each class shall be determined by the Board of Health, and not by the examiners. New rules and regulations shall be adopted from time to time as required, and alterations and amendments made.

RULES FOR CONDUCTING EXAMINATIONS.

RULE 1. For the *qualitative* estimation of color-blindness the following tests are to be employed: Holmgren's Worsteds, the Tables of Stilling Donder's Color Test Patterns, Pflüger's Letters with Tissue Papers, Däae tests and Woinow's Revolving Cards may also be used.

For the *quantitative* test for color-blindness, Donder's Reflected Spots, Donder's Method with Transmitted Light, Holmgren's Shadow Tests shall be employed.

RULE 2. The following are the requirements for a certificate in the first class:

1. Healthy eyes and eyelids without habitual congestion or inflammation.
2. Unobstructed visual field.
3. Normal visual acuteness.
4. Freedom from color-blindness.
5. Entire absence of cataract or other progressive disease of the eyes.

The second class shall have:

1. Healthy eyes and eyelids without habitual congestion or inflammation.

2. Unobstructed visual field.

3. Visual acuteness at least equal to $\frac{3}{5}$ without glasses and normal with glasses in one eye, and at least $\frac{1}{2}$ in the other eye with glasses.

4. Freedom from color-blindness in one eye, color-perception at least equal to $\frac{3}{4}$ in the other eye.

RULE 3. In the case of employees who have held their positions five years or more, the standards required in each class shall be determined under special instructions from the Board of Health.

AUGUST 25, 1880.

The following rules and instructions have been added to the printed rules for examination of railroad employees for visual acuteness and color perception, since their publication.

RULE 1. Brakemen shall be transferred to Class Second.

RULE 2. The certificates shall be retained until all on a given road, or within a certain vicinity, have been examined, and then distributed by the railroad officials.

The blanks after "find that is" shall be filled by "sufficient under the rules of the Board" in *all* certificates granted. Those that fail to pass the tests for color-blindness shall be at once informed as privately as may be, and re-examined at the convenience of the examiner as hereafter provided. Care shall be taken to make the employees rejected understand all their chances under the rules.

The following instructions under this rule have also been issued;

1. The standard for visual acuteness shall be two-thirds instead of $\frac{20}{20}$ (twenty-twentieths).

2. Engineers with a vision of $\frac{20}{20}$ in one eye, and $\frac{1}{3}$ in the other, with no progressive disease of either eyes, and sufficient color-perception shall be granted First Class certificates.

3. Those failing in the tests for color-perception (Rule 1st, page 6) shall be tested by flags and lanterns at a distance of 80 rods. New and old flags are to be used, and such flags and lanterns as are used for making signals on the road in question. The examiner shall satisfy himself that the employee can distinguish colors correctly.

By order State Board of Health,

Attest, C. W. CHAMBERLAIN, M. D., *Secretary.*

Connecticut is a pioneer in this work in this country, being the first State to pass a law requiring examination of all railroad employees engaged in moving trains. The standards adopted are for the most part those agreed upon at the International Medical Congress at Amsterdam, September, 1879.

The following is the form of certificate. These are bound in books, the stubs retained for reference and tabulations. The form of regular returns by the examiners to the Board follow.

STATE OF CONNECTICUT,

No. STATE BOARD OF HEALTH, BUREAU OF VITAL STATISTICS.

CERTIFICATE OF EXAMINATION FOR VISUAL POWER AND COLOR-BLINDNESS.

This may certify that I have this day tested carefully the VISUAL POWER *of* *whose signature is attached to this certificate, and find that it is* *I have also tested his* COLOR-PERCEPTION, *and find that it is* *He is, in these respects, fitted for the position of*

Given in presence of the Examiner.

Examining Ophthalmic Surgeon.

18 .

Signature of party examined.

STUB ACCOMPANYING CERTIFICATE AND RETAINED BY THE EXAMINER.

No.

Name, ; Age, ; Height, ; Complexion, ; Occupation, ; Vision, ; Color Perception, ; Railroad, .

Examining Surgeon.

POSTAL CARD REPORT FROM THE EXAMINERS.

18 .

Report for week ending 18 .

Number in Class First examined, - - - - - - - ———

Number in Class Second examined, - - - - - - ———

Total, - - - - - - - - - - ———

Number with incomplete color-sense, - - - - - - ———

Number with complete color-blindness, - - - - - ———

Number with defective visual power, - - - - - - ———

Connected with which Railroads,

The following is the letter requesting a hearing by the employees, through their attorney.

NEW HAVEN, CONN., August 5, 1880.

C. W. CHAMBERLAIN,

Secretary State Board of Health, Hartford, Conn.

SIR: I have before me a petition to the State Board of Health, a copy of the heading of which I herewith inclose—signed by about two thousand men, to wit, by presidents, ex-presidents, superintendents, conductors, engineers, brakemen, flagmen, station agents, and other employees of all the railroads in this State, and by other citizens.

They have instructed me, as their attorney, through a committee who have their interests in charge, to request through you as Secretary that said Board be convened as soon as practicable, so that they may have a hearing upon said petition.

They would be glad to have the meeting called in this city, as more central than any other place in the State for all parties in interest; and to facilitate matters, they offer to the Board the use of Brewster's Hall in this city, corner of Chapel and State streets, as a place of meeting.

They also request the Board to convene on Thursday of next week, August 12th, at 10 A. M., if such time will be convenient for them; if not, then at the earliest possible time thereafter.

As the petitioners will need a little time to procure the presence of interested parties, after they know the time and place of meeting, will you oblige me with an early reply to this letter, stating whether the Board can be convened at the time and place mentioned, and if not when and at what other place, at their earliest convenience.

I am, truly and respectfully,

D. R. WRIGHT,
Attorney for Petitioners.

At the second meeting the following papers were presented:

NEW HAVEN, CONN., August 16, 1880.

To the Honorable State Board of Health:

GENTLEMEN: Inclosed please find the rules for the examination of railroad employees, which my clients desire your Board to adopt, and which you requested me to draft and submit for your consideration.

We think the law is wholly unnecessary, and that the public is safer without the law than with it; that the science of color-blindness (if indeed it may yet be called a science), is at least in its infancy; that there is in no State or nation a legally-tabulated set of rules in force as

a test for the existence of color-blindness except in Holland, and those differ very much from the ones now in use by the State Board of Health; and that the application of the tests adopted by the Board is not such as to increase the safety of travel, but on the contrary are unjust in their operation to the railroad employees.

The tuition and trial of railroad employees in a practical way by the officers of railroads, during a long period of time before they are promoted to responsible stations, are of themselves a sufficient guarantee of safety to the traveling public; especially when the interest, the responsibility, the property, and profit of railroad corporations all combine to have none but competent persons employed.

The law is also crude in its provisions, uncertain as to some of its enactments, and might with propriety be suspended in its operation till the next session of the General Assembly, so as to be made by amendment more practical and just, instead of being used, as it must necessarily be as it now stands, only for the purpose of gathering statistics for the development of a supposed science still in embryo, by subjecting a meritorious class of workingmen to be experimented upon. Nevertheless, we do not ask for such suspension of the law, but desire that it shall be executed in a manner just to the employees and safe to the public, and both of these ends may be secured by making all examinations practical in the manner provided by the rules submitted.

In order to expedite the work, and to provide a way of sifting out the deficient ones, the third rule is introduced, providing for a preliminary examination.

We submit schedule "A," appended to the rules, as containiug reasonable suggestions as to the tests that might be used, and the circumstances under which they might be applied; but we do not ask that said schedule "A" shall be adopted as a rule. I shall send a duplicate of this letter, said rules and said schedule "A," both to the Secretary and to Mr. Burr, so that they may the more surely be received by the one in the absence of the other.

I would like to be notified of the time and place, when and where the Board will next convene, which I trust will be soon, so that myself and the Chairman of the Committee of Employees may be present, to answer any questions or make further suggestions.

I am respectfully,

DEXTER R. WRIGHT,

Attorney for R. R. Employees.

RULES SUBMITTED BY RAILROAD EMPLOYEES TO THE STATE BOARD OF HEALTH FOR ADOPTION.

RULE 1. All railroad employees required to be examined under the law of March 25, 1880, shall be subjected to the same practical tests as they are subjected to in the course of their employment, and not to fanciful or theoretical tests.

RULE 2. All examinations for detecting color-blindness and ascertaining the visual power shall be conducted with such flags, lights, and other signals only as shall conform in all respects, as nearly as practicable, to those *in actual use* by the railroads of this State; and all examinations shall be made under the same circumstances, so far as practicable, as those that occur in the actual operation of said railroads.

RULE 3. As only a small percentage of those to be examined are color-blind or have defective vision, no objection is made to a preliminary examination *with the same tests* as those mentioned in rule second, and under circumstances varied from those specified therein, to suit the convenience of the examiner, and secure dispatch in making examinations. But if such preliminary examination shall give rise to a suspicion that the employee is color-blind or has defective vision, in any degree, he shall be subjected to the full test provided for in said rule second.

RULE 4. In granting certificates, the success and experience of the employee, during the time he has been engaged in railroad service, shall be duly considered.

RULE 5. All rules and regulations of the State Board of Health inconsistent with these rules are repealed.

SCHEDULE "A." BEING SUGGESTIONS.

Signals to be used may be red, white, and green flags and lights.

TESTS FOR SUPPOSED COLOR-BLINDNESS.

The applicant shall be able to distinguish the flags, one from the other; also lights, the one from the other. In this test distance is not to be regarded.

TEST FOR VISUAL POWER.

A red or white flag displayed 80 rods off. In this test, the flag to be used or waved with energy and rapidity, in the same manner as a person would use it *to flag* an approaching train.

A green flag being used only as a train-signal, distance is not material.

Signals same as at masthead of drawbridge by day or night, 150 rods off.

Red, white, and green lights by night, 100 rods off.

Switch targets by day, same distance as flags: to wit, 80 rods off. Tests to be made under fair conditions of atmosphere.

STENOGRAPHIC REPORT OF TESTIMONY.

GEORGE H. WATROUS, Esq., President of the N. Y., N. H. & H. Railroad, spoke as follows:

Mr. President and Gentlemen:

Upon looking at this question I am a little surprised, I confess, that it should be claimed there is any meaning attaching to the word "normal" in the third section of the Act which is not to be gleaned in substance from the two preceding sections. "Normal" doubtless sometimes has a technical meaning, but it may be absolute or relative. There is nothing said about any particular *grade* of visual power; but doubtless a crude way of arriving at the subject-matter must have been had in mind. Is not the "normal visual power" referred to that kind of visual power requisite for the person in whose behalf a certificate is issued, to perform the duties to guard against the dangers of which this law was passed? Is not that the rational meaning of the word "normal"—meaning *proper* visual power? They should discover the kind of visual power required; for it must be assumed, I am sure, that the Legislature intended to guard against what they conceived to be a *real*, not an imaginary, danger. They intended that you should adopt such measures as would guard the public against the danger of having trains managed by men who cannot discern the signals. That result accomplished, you have gone as far as the Legislature obviously intended you should go. It was not intended that you should make these men experts in color, or that you should educate them for some other calling. To increase the safety of travelers I take it to be the manifest object, and any resources that will reasonably conduce to that end ought to be insisted upon. I remember when it was almost thought to involve the necessity of writing a will to take a long journey by railroad. Curious statisticians have collected data showing that the safest place on earth is on a moving train, under existing management.

Now when you have adopted a rule that engineers shall discern and distinguish the signals, that was as far as it was intended you should go. That is all I have to say about the meaning of the statute.

We have some 80,000 miles of railroad and not an accident has arisen from this cause. I suggest that you lay the law quietly aside when you discover that by enforcing it (in the adoption of such rules as you have adopted) you work out these two results—injury to the employees, and to the companies. I fear these results might ensue. I am not here as counsel; I am here as a friend of our employees and of our company. I fear, in the first place, that the application of these rules *may* work injustice to worthy men. I fear that we ourselves have got some men who, though able to tell red and green and white as unerringly as any one, nevertheless would be puzzled by the nomenclature of colors and shades of colors. If they can tell red and white and green it is not of the slightest consequence, so far as their duties are concerned, whether they can distinguish shades of greenish yellow. I am afraid there may be some who

are deficient in these respects. I do not want to see those men who take their lives in their hands, who spend so many years in learning this perilous service that they really forget how to do anything else —to whom an engine is an inseparable companion—I do not want to see them thrown out.

But I also take the Company's interest into account. While we do not want a man in our service whose deficiency in any respect would imperil a passenger over our road, yet I am free to say, if we have a man who has successfully run our trains for many years, making his time, watching and obeying the signals, and carrying thousands of passengers safely, quickly, and comfortably—we do not want that man to be thrown out of our service because, forsooth, he cannot distinguish all shades and comply with these jaw-breaking tests. Bear in mind, I do not want a man who cannot distinguish the signals—red, white, and green—at the requisite distance; white meaning safety; green, caution; red, danger.

I do not want to be compelled to substitute for that experienced man a new man, no matter how good his optics, and have the responsibility of running that train down into New York. On *your* account I should say, "Keep the man we *know* we can trust, rather than take a new man who don't know the ins and outs of our road." If you insist that we shall dismiss the good man *we* are willing to trust, and take the untried men *you* are willing we should use, then I ask that you, the State, shall take the responsibility of running the trains, and if disaster ensues pay the bills.

[Mr. A. E. Burr, of the Board, stated that he had listened with much interest to the remarks of Mr. Watrous and the others, but that there was one particular point which had not been brought out, and he put this question:]

Q.—Suppose you have five *new* applicants for situations. They are tested by the colored worsteds and two of them fail to match the colors; three succeed. Which of them would you accept?

A.—I should certainly prefer the three who could distinguish the colors. I do not question the wisdom of these rules as a means of ascertaining whether or not a man is color-blind.

Mr. Burr.—Your old engineers have been granted certificates, even those whose vision was not perfect, having in mind their long experience. Our fifth rule requires that action. Our sympathies are with these men so long in your employ, and we have discriminated in their favor. It is a delicate question. But the *new* applicants have to be dealt with. Now, how far shall we go with them?

Mr. Watrous.— I should prefer that they be able to distinguish the colors and shades of colors. I would not take, nor permit the Supervisor of our Motive Power to take, a new man unacquainted with our road whom Dr. Carmalt said was absolutely color-blind.

Dr. Chamberlain.—Regarding the old employees. Would you be willing to trust to their power of determining the color by the *intensity*

of the light—which is the principal guide to the eye of a man who is color-blind?

Mr. Watrous.—We have an engineer of ten years' experience,—say on our New York Division, where are running thirty trains in and out daily (not including freight trains). If for ten years he has run on the railroad, going through 626 times a year, and has never failed to note the right signal under any circumstances, and has never had an accident attributable to failure to see, I should be very unwilling, under the sense of the responsibility upon my shoulders, to change that man for any new man on your endorsement.

Mr. Burr.—This man's training makes him a pretty safe engineer even if he be a little color-blind?

Mr. Watrous. Yes, sir. But if he were a *new* man I should reject him at once. We certainly want no one on our engines who would imperil the lives of our passengers.

Dr. Chamberlain.—Take the case of this man whom you have given, as an illustration: Let us change the *intensity* of the signal lights. If he fails correctly to distinguish them would you then wish to retain him?

Mr. Watrous.—I should have my doubts about it. I should be doubtful about retaining such a man.

By Mr. Lippitt of the Board.—Suppose that test was adopted: To tone down the lights and ascertain the perception of color by differing grades in intensity?

Mr. Watrous.—If you continue that process until you get a condition of things never to be met in his practice it would be unjust. If you reject a man simply because he is not free from color-blindness, in the scientific sense, you do the man a greater wrong than you do us.

Mr. Wright.—Would you employ the same reasoning regarding visual power as to color-blindness?

Mr. Watrous—By that I suppose you mean range or reach of vision. If a man is near-sighted, or for any cause cannot see the signal at the distance required for the safe running of the trains, I do not want him. But if he can discern the signals unerringly every time at such distance as he is *required* to, and for thirty years has done so, I should be rather unwilling to reject that man because he could not see double the required distance. Ordinary passenger trains can be stopped with the Westinghouse brakes within 300 to 500 feet. Eighty rods is as far as any railroad regulations require a signal to be discerned; that is, safety is secured if the object is discerned 80 rods off.

Mr. Lippitt.—Is it any part of the *conductor's* requirements to know the signals?

Mr. Watrous.—It is to this extent: The conductor, under our rules, must see that the "draw-signals" are right every time before the train starts. The engineer cannot start the train until they *both* see the signal.

Dr. Lindsley of the Board.—Are our rules and regulations, in your opinion, too exacting and severe for your present employees?

Mr. Watrous.—We feel more sensitive about our *engineers.* A good engineer of experience on the road, and otherwise right, is a pretty desirable employee. The best engineer on another large road could not run an engine on our road without first learning it [the road] thoroughly.

Dr. Lindsley.—Ought they not, when you begin to train them, have good vision?

Mr. Watrous.—The engineer starts as a fireman; or perhaps, he comes out of the shop. But even then he "fires," frequently, before he takes an engine. So we possibly cannot take a new man.

Mr. Burr.—Have you any rule regarding the losing of eyesight by age, applicable to your men?

Mr. Watrous.—We have no established rule. If there is anything else for him to do, we give him that. We don't mean to turn him adrift.

Mr. Burr.—Would not the examination be worth something to you in that case?

Mr. Watrous.—To be frank, I think we are as capable of settling that question ourselves,—not for scientific purposes, but as to ability to discern signals.

Mr. Burr.—Have you officers to test them?

Mr. Watrous.—No, no special officers. It would be done by the Superintendent of Motive Power. I can see of course, that it *might* happen we should keep a man who could not discern the signals; but although the agitation of this subject is well enough, you have not any such interest in the matter as we have.

Mr. Burr.—Certainly not. But this duty was put upon us. I wish they had referred it to the Agricultural Board. There is not a member of this Board who would wish to make any arbitrary rules to the injury of your engineers or yourselves. We had nothing to do with the making of this law, which says it is necessary to examine these men. *You* have not selected any person to examine your employees for failing eyesight, when, say, fifty years old. The State has done so. Now, is that a wrong step for the State to take?

Mr. Watrous.—No, I would not dare to say that, sir. I do not want any men retained in service if they are unfit in this particular matter of vision. Whatever my feelings might be for the men I could not, either as a man, or an officer, afford to retain such. I am not here to plead for permission to retain an incompetent man one instant. A man whose vision I am in doubt about, I do not want. But if I have a man who can tell the signals we use, and has proved his ability by years of experience, I do not want to lose this man. I do not want *you* to lose him. We cannot afford to lose him to comply with any scientific tests.

Mr. Burr.—Do you think these tests are too rigid for *new* applicants?

Mr. Watrous.—They may not do any hurt as regards new applicants. Our chief cause of complaint is concerning the men actually in service. I think the tests in their case should be more practical.

Mr. *John H. Leeds* being called upon, after a few preliminary remarks, said:

I was waited upon by a delegation of engineers who came to me for sympathy and advice. Among them were men whom I started with in life, with whom I have been long associated, and I very naturally sympathize with them. I recommended them to get a hearing before this Board if possible.

The intent of the law I will not discuss further than to say that, while its spirit may have been good, the passage of the law in its present language was unnecessary, and its operations will work severe injustice to a large class of very worthy men. I plead in their behalf for a modification of these rules. I am an engineer myself, and was in active service about ten or eleven years, I think.

The first system of signals in these New England States I put up myself, and I have been familiar with the whole subject from its infancy. I travel a great deal upon the railroads, of course. I want to ride behind men who are tested with the implements they work with, and under the conditions they are obliged to use them—men who are selected by the officials of the road, and not by an appointee of the State.

Mr. Wright.—Suppose the men were tested in a long hall in daylight, with the red, white, and green flags; the hall darkened, and red, white, and green lights substituted. Would that be a practical test?

Mr. Leeds.—Well, yes, substantially.

Mr. Wright.—Suppose the same thing was repeated in a field with a range of 40 rods?

Mr. Leeds.—I would rather go upon the track.

Mr. Lippitt.—At what distance ought a person to be able, for safety, to see a red light?

Mr. Leeds.—I must qualify my answer. If the atmosphere is in a favorable condition, he can see his red light a mile away.

Mr. Lippitt.—Your answer then is, that he ought to be able to see a light in clear weather a mile ahead?

A.—Yes, with clear weather.

Mr. Lippitt.—Suppose he couldn't see it more than 300 feet distant?

Mr. Leeds.—If an engineer couldn't see a red light more than 300 feet under the same atmospheric conditions that another engineer could see it a mile, I should say he was disqualified.

Mr. Lippitt.—Suppose in misty weather the intensity of the light should be so modified that red should appear green to him, or *vice versa*, would he be a fit man to run a locomotive?

Mr. Leeds.—Well, under the same conditions, if the light appeared red to him when it was a green light, and he couldn't make anything else out of it, I should say he was disqualified.

Mr. Lippitt.—He would be unsafely color-blind?

Mr. Leeds.—He would. But the qualifications of an engineer other

than simple eyesight are so much more important, that, while this is the subject matter under consideration, yet under this present practice the most valuable engineers the world has ever produced would be disqualified.

Mr. Lippitt.—Do you think it wise or unwise, that persons new to the business should be tested?

Mr. Leeds.—Most certainly I approve that part of it.

Mr. Lippitt.—Would you put upon a locomotive any man who could not succeed in these tests?

Mr. Leeds.—I don't know as I can say about *these* tests. I would try a man with the practical tools of railroading.

Mr. Lippitt.—But if a man has demonstrated by a service of many years that he can discern the signals, you deem him safe?

Mr. Leeds.—I should, and for this reason, which covers the whole ground: no matter what the result of this test, I know that no engineer can for a single week safely run his train over the Consolidated Road, especially the New York division, particularly below the Harlem River, without proving his ability as a good engineer. If these tests show him to be absolutely color-blind, still there must be, I suppose, some conforming by nature in spite of weaknesses, so that he learns somehow to be a perfectly safe man.

Dr. Chamberlain.—Is not red *red*, whether in worsted or flags or lights?

Mr. Leeds.—Well, yes, substantially, as I understand it. But there are many other qualifications that go to make up a good engineer besides ability to distinguish these colors. There must be men in our service, I suppose, who are bordering on that age when they must retire on account of their eyesight; and to the proposition that there should be some practical test I take no exception. But it should not take men with nerve, brain, and experience. When you speak of throwing out such men it becomes a very serious matter both to railroad companies and to the employees themselves. It is impossible to run a train by sight alone. I would almost take the position that, as an engineer, I would rather lose my sight than to lose my hearing or my sense of smell or my intuitiveness. There are times when an engineer cannot see ten feet, I don't care how good his vision is. In frosty nights, when the engineer has run seventy-five miles with his head out of the cab window, his face becomes as white and bloodless as that paper. [Mr. Leeds related an incident confirming this.] We run in the darkest nights, in all kinds of stormy weather, or with the mercury at freezing. Of course eyesight is valuable, and I want them to have it, but it is not the all-important thing. You do not know the class of men you are going to throw out of service here. I have a right to plead for these men. Now, we very often hear of brave captains and seamen and generals, and so on. They *are* brave men. But I tell you there is no man or class of men equalling the true railroad man in bravery. You do not know the scenes of danger through which they have to pass. A sea-

captain may choose a favorable time to take his boat to sea; but with the engineer, when the pointer comes to the hour, he must go; no matter what the weather, or the danger, or the conditions surrounding him! The time must be made, and must be made in safety.

Mr. Burr.—This law confines us entirely to the question of sight. Whether the engineers have the other necessary qualifications, are temperate, etc., are questions not referred to us. We were not responsible for the law, and we have as much feeling for the railroad employees as yourselves. We would like to have you state, *in writing*, how you want these rules modified.

Now, in this connection, I wish to ask you this: If a man is partially color-blind and a little short in visual power, do you think he can train himself by practical work on the road, by observing the conditions of the light as to intensity, etc., so that he can overcome his visual defects?

Mr. Leeds.—That is my opinion; yes, sir.

Mr. Burr.—I want to ask another thing. Shall we deal entirely with the tools with which they work? For instance, why not take any object of a red color and request the applicant to match that, and if he puts a green color upon it, does not that prove his defective perception of colors? Is there such a difference as claimed between the rays of light from a lantern and from solid colors?

Mr. Leeds. I believe it is stated that color-blind persons can discriminate between colors from a transmitted light when they cannot with a reflected light.

Mr. Burr. But is not that test stated in my last question a fair test for a new man?

Mr. Leeds. In reply to that I will say, that what I should call a practical test—one to which I would be willing to have any apprentice subjected—is this: Let the young man be tested with the red, white, and and green flags that we use. Let him match those flags on the sticks where they belong. If he matches them correctly, that would be a practical test. If, however, he should put the red flag upon the green flag, and say they were alike, I should say there was a place for him in some other capacity.

Mr. Burr. Allow me to ask you if it is not well to have the best *eyes* as well as the best *car-wheels?* If the young man fails in the test with reflected rays of light, is there not a serious defect in his eyesight?

Mr. Leeds. I say *yes;* unqualifiedly, yes. But you do not comprehend exactly my motives when I allowed my sympathies to plead in behalf of the men. It was because these rules and regulations were too critical and too severe for men already operating railroads, and because they are going to work such widespread injustice to those men. It was that that led me to plead in their behalf, and to ask your sympathies and to ask you to make these rules and regulations conform to practical tests by the tools they work with, and under the conditions in which they work. [Mr. Leeds continued at some length, explaining the duties and perils of engineers, and reciting their experiences.]

REPORT OF DR. W. T. BACON,

EXAMINING OPHTHALMIC SURGEON.

To the Honorable State Board of Health:

GENTLEMEN,—I have the honor to transmit the report of examinations of such railroad employees as were assigned to me, in reference to their visual acuteness and color-perception under the rules and regulations adopted by your Honorable Body. Table No. 1 gives the number examined on each railroad, classified according to their occupations, and the number in each class. Table No. 2 shows the number in each class who are partially and completely color-blind, also the number having defective vision, with the per cent. of deficiencies. Table No. 3 states the number on each railroad found partially and completely color-blind, the number with defective vision, and the percentage of each defect.

TABLE No. I.

REPORT OF EXAMINATIONS OF RAILROAD EMPLOYEES FOR VIEW AND COLOR-PERCEPTION.

Number of Each Class Examined.	New York & New England.	N. York, N. Haven, & Hartford. Hartford Division.	New London & Northern.	Norwich & Worcester Division, N. Y. & N. E. R. R.	Conn. Western R. R.	Hartford & Conn. Valley R. R.	N. York, Providence, & Boston R. R.	South Manchester R. R.	Total.
Engineers,	42	32	14	22	9	11	24	1	160
Firemen,	47	36	10	21	10	8	24	1	157
Conductors,	32	20	8	10	6	6	17	1	100
Brakemen,	98	61	21	53	34	18	41	1	327
Switchmen,	12	32	12	6	5	4	19	..	90
Station Agents,	26	16	10	9	20	12	3	1	97
Flagmen and all other Signalmen,	64	14	1	..	14	..	5	..	98
Total,	326	211	76	121	98	59	133	5	1029

TABLE No. II.

SHOWING DEFECTS OF EACH CLASS OF EMPLOYEES.

NAMES OF EACH CLASS.	Red or Green Blind.	Defective Color-perception.	Vision less than Normal or 20-XXths.	Total Defection.	Per cent. of complete Color-blind.	Per cent. of defective Color-sense.	Per cent. of defective Vision.
Engineers,	3	1	10	14	1.8	.06	6.2
Firemen,	5	1	12	18	3.1	.06	7.6
Conductors,	3	. .	4	7	3.	. . .	4.
Brakemen,	12	7	30	49	3.6	2.1	9.2
Switchmen,	6	3	8	17	6.6	3.3	8.8
Station Agents,	2	1	10	13	2.	1.	.04
Flagmen and all others,	4	. .	4	8	4.	. . .	4.
Total,	35	13	78	126	3.4	1.2	7.5

TABLE No. III.

STATEMENT OF DEFECTS FOUND ON EACH RAILROAD.

NAMES OF ROADS EXAMINED.	Red or Green Blind.	Defective Color perception.	Defective Vision in one or both Eyes.	Per cent. of Color-Defects.	Per cent. of Visual Defect.
New York & New England,	12	5	25	5.	7.6
N. Y., N. H., & H., Hartf'd Division,	7	2	24	4.2	11.
New London & Northern,	1	. .	6	1.3	7.9
Norwich & Worcester Division,	7	1	4	6.6	5.1
Connecticut Western,	1	3	10	4.	10.2
Hartford & Connecticut Valley,	1	. .	2	1.7	3.3
New York, Providence & Boston,	5	2	7	5.3	5.3
South Manchester,	. .	. .	. .	. . . .	. . .
Of no road,	1	. .	. .	100.0	. . .
Total,	35	13	78	4.6	7.5

The whole number examined is one thousand and twenty-nine. Of these thirty-five were found more or less blind to red and green, and thirteen with defective color-perception, but able to recognize

red and green under ordinary circumstances. The methods used were Holmgren's Worsteds and Stilling's Plates for qualitative estimations of color-blindness. For the quantitative estimations, Donder's Reflected Spots were employed. Those failing to show satisfactory color-perception by the tests enumerated were tried with the flags and lanterns at 80 rods, one or both, in use on the road. Of the twenty-five color-blind to red or green, twenty-four appealed to the flags, and twenty-one of these failed in distinguishing red from green, while three named the colors correctly. In testing with the flags one of the officers of the road was always present, and his color-perception compared with the employees' and with mine. My experience with the flag test has convinced me that it is a wholly unreliable method for the detection of color-blindness, and may have a worse effect than if it had not been used, by giving to the color-blind,—who by some chance may have told the colors,—a false confidence which he did not before possess. Even those tested by it are not satisfied, as their failure is almost always attributed to some cause, as the light, want of sleep, etc. The three who called the colors correctly were quite blind to green by all the other tests used, and are in my opinion equally if not more dangerous than those unable to name the flags. Besides its unreliability, the tests with flags and lanterns is impracticable when a large number of men are to be tried, and I doubt if the employees of the roads in this State could have been tested by this method during the three months given by the law without great loss of time and inconvenience to the railroad companies. The method which especially commends itself is that of Holmgren's, and the more it is used, the better appreciated for its certainty in detecting slight defects of color-perception, as well as those who are completely color-blind. It can be carried and used anywhere, and the time consumed in the detection of the color-blind is very short; all of which commends it for use on railroads. My experience has not shown me that Holmgren's test confuses the ignorant, and that they are liable by it to make themselves appear of defective color sense; on the contrary they pick out the worsteds with nearly equal facility with the educated of the same color-perception. All recorded as color-blind have been re-examined one or more times with different tests, but with the same result.

Under the head of defective vision are recorded all who failed to read Snellen's Test Types No. XX at twenty feet, with each eye separately; or the other letters at the proper distance. Each per-

son having one or both eyes of vision less than normal is recorded as defective. This makes the number somewhat large, but does not mean that so many are unfit for railroad service. The vision of many can be brought up to the standard by glasses, and others have one good eye, with the other more or less deficient.

I take this opportunity to thank the railroad officials for their uniform courtesy, and for their aid in conducting the examinations by affording me every facility asked. I have the honor to be,

Very respectfully,

WM. T. BACON, M.D.,

One of the Examining Ophthalmic Surgeons of Conn.

REPORT OF DR. W. H. CARMALT,

ONE OF THE EXAMINERS.

NEW HAVEN, December 1, 1880.

To the State Board of Health:

GENTLEMEN,—I have the honor to report that in obedience to your instructions I began, on July 26th, the examination of the railroad employees coming under the provisions of the law of March 25, 1880, with regard to visual power and color-blindness, on the following railroads, viz.: New York, New Haven & Hartford Railroad, Housatonic Railroad, Naugatuck Railroad, New Haven & Northampton Company's Railroad, Boston & New York Air Line Railroad, Danbury & Norwalk Railroad, Shepaug Railroad, New Haven, Derby & Ansonia Railroad, New Canaan Railroad, and continued the examinations according to the published rules of your Board as rapidly as circumstances would permit, until August 20th, when I received orders from you to discontinue the examinations pending action of your Board on a petition of the employees for modification of the Rules.

On August 24th, the following "Appendix to the Rules and Requirements" was issued to me, viz.:

"The following are the rules and instructions for the examination of railroad employees for color-blindness and visual power, which have been added to the printed regulations.

"RULE 1st. Brakemen shall be transferred to Class Second.

"RULE 2d. Certificates shall be retained until all on a given road or within a certain locality have been examined, and then distributed through the railroad officials.

"The blanks after 'find that it is,' shall be filled by 'sufficient under the rules of the Board of Health,' in all certificates granted. Those failing to pass the test for color-perception shall be at once informed as privately as may be, and reëxamined as hereafter provided, at the convenience of the examiner. Care shall be taken to make the employees rejected understand all their chances under the rules.

"RULE 3d. (p. 7.) The following special instructions have been issued under this rule:

"1st, The standard for visual acuteness shall be two-thirds instead of twenty-twentieths.

"2d, Engineers with no progressive eye disease, sufficient color perception, vision of one eye twenty-twentieths, of the other not less than one-third, shall be granted a first-class certificate.

"3d, Those failing in the tests for color-perception (Rule 1, p. 6) shall be tested by such flags and lanterns as are used for signaling on the road in question. The flags shall be two feet by eighteen inches, and both new and old flags are to be employed. The flags by day and the lanterns at night shall be used at a distance of eighty rods. The examiner shall satisfy himself whether the employee can distinguish the color of the flags and lanterns or not, and report the results in rejected cases to the Board.

"By order of the State Board of Health,

"A true copy from the records,

"(Signed,) C. W. CHAMBERLAIN, *Secretary*."

On August 28th, I recommenced the examinations, acting strictly under these modified rules. On the same day I also forwarded to you the following protest against them:

"NEW HAVEN, August 28, 1880.

"*Dr. C. W. Chamberlain, Secretary, etc.:*

"DEAR SIR,—The modified rules for the examination of railroad employees under the Act of March 25, 1880, as passed by your Board on August 24th, have been received, a few examinations made, and I shall continue to do so, as instructed. I beg leave, however, to state my professional opinion as expert, that by the rules thus modified the tests are crude and unreliable; therefore also impracticable, and render the examiner very liable to give certificates to employees who would not come under the designation of having 'freedom from color-blindness and possession of normal visual power.'

"Respectfully,

"Signed, W. H. CARMALT, M. D."

I continued of course to make the examinations strictly as instructed, making all the haste possible, until September 30th, when I had the honor to submit a report of 906 men examined. Since then 15 men, old employees, have presented themselves, having from various, mostly unavoidable, reasons on their part been unable to do so before. I have therefore examined 921 actual employees. The results are classified in the following tables, which will, I think, give all the information desired.

Whole number of old employees examined, - - - - - - 921

	Whole No. of Employees, by last Report of R. R. Com'rs.	Number Examined.	Per Cent.
On N. Y., N. H. & H. R. R. (including Shore Line),	2,110	474*	.22
" Housatonic R. R., - - - - - -	420	141	.335
" Naugatuck R. R., - - - - - -	254	105	.41
" N. H. & Northampton Co., - - - - -	354	70	.197
" B. & N. Y. Air Line R. R., - - - - -	116	45	.388
" Danbury & Norwalk R. R., - - - - -	120	34	.28
" Shepaug R. R., - - - - - - -	60	28	.46
" N. H., Derby & Ansonia R. R., - - - -	54	21	.39
" New Canaan R. R., - - - - - -	9	3	.33
		921	

* Over 200 more were examined by Dr. Bacon, so that the real percentage is greater on this road.

VISUAL DEFECTS ON ROADS.

	Number Examined.	Defective Acuteness of Vision.	Per Cent.	Dichromatic.	Per Cent.
On N. Y., N. H. & H. R. R., - - -	474	70	.047	12	.025
" Housatonic R. R., - - - -	141	15	.106	5	.035
" Naugatuck R. R., - - - -	105	15	.142	3	.028
" N. H. & Northampton Co., - - -	70	5	.071	5	.071
" B. & N. Y. Air Line R. R., - - -	45	9	.20	1	.022
" Danbury & Norwalk R. R., - -	34	8	.235	..	....
" Shepaug R. R., - - - - - -	28	1	.038	1	.038
" N. H., Derby & Ansonia R. R., - -	21	4	.19	1	.047
" New Canaan R. R., - - - -	3	..	....	..	....
	921	127		28	

OCCUPATIONS AND VISUAL DEFECTS ON ROADS.

	Engineers.			Firemen.			Conductors.			Brakemen.			Switchmen, etc.			Station Ag'ts.		
	Whole Number.	Defective Vision.	Dichromatic.	Whole Number.	Defective Vision.	Dichromatic.	Whole Number.	Defective Vision.	Dichromatic.	Whole Number.	Defective Vision.	Dichromatic.	Whole Number.	Defective Vision.	Dichromatic.	Whole Number.	Defective Vision.	Dichromatic.
On N. Y., N. H. & H. R. R.,	60	12	2	58	4	....	54	9	1	184	22	8	80	17	1	38	7	....
" Housatonic R. R.,	23	3	....	27	2	....	15	1	....	43	4	2	16	3	1	17	2	2
" Naugatuck R. R.,	16	3	1	9	....	....	11	....	1	31	5	1	19	2	....	19	5	....
" N. H. & Northampton Co.,	11	3	....	12	....	1	8	....	1	19	1	2	8	....	....	12	1	1
" B. & N. Y. Air Line R. R.,	7	1	....	8	....	1	5	2	....	9	2	....	6	....	....	10	4	....
" Danbury & Norwalk R. R.,	6	....	....	5	....	....	4	2	....	10	3	....	3	....	....	6	3	....
" Shepaug R. R.,	4	....	1	5	....	....	2	....	....	4	....	....	2	....	....	11	1	....
" N. H., Derby & Ansonia R. R.,	3	1	1	3	....	....	3	....	....	7	1	....	3	....	....	2	2	....
" New Canaan R. R.,	1	....	....	1	....	....	....	....	....	1	....	....	....	....	....	....	....	....
Total,	131	23	5	128	6	2	102	14	3	308	38	13	137	22	2	115	25	3
Percentages,		.175	.038		047	.015		.137	.029		.366	.042		.16	.014		.217	.026

CLASSIFICATION OF VISUAL PERCEPTION.

Normal vision in both eyes in all grades of service, - - - - -			766	
Defective acuteness of vision in one eye, - - -	51			
Defective acuteness of vision in both eyes, - -	75	126		
Defective color-perception, or Dichromatic vision, -		28	155	921

Percentage with defective acuteness of vision, -	.137
Percentage with Dichromatic vision, - -	.03
Percentage with defective vision, - - -	.168

VISUAL DEFECTS CLASSIFIED BY OCCUPATION.

	Engineers.	Firemen.	Conductors.	Brakemen.	Switchmen.	Station Agents.	Total.
Defective acuteness of vision in one eye, - -	11	3	8	18	4	7	51
Defective acuteness of vision in both eyes, - -	12	3	5	20	17	18	75
	23	6	13	38	21	25	126
Defective color-perception, or Dichromatic vision,	5	2	4	13	2	3	29
	28	8	17	51	23	28	155

CERTIFICATES ISSUED, CLASSIFIED BY OCCUPATION.

	Engineers.	Firemen.	Conductors.	Brakemen.	Switchmen.	Station Agents.	Total.
1st class issued by Examiner, - - - - -	103	120	85	257	114	87	766
" " " under "modified rules,"	14	3	1	...	...	8	32
" " by especial order of B. of H., -	13	3	...	...	...	...	16
2d class issued by Examiner, - - - - -	...	1	10	19	16	10	56
" " " under "modified rules"	...	...	3	7	3	2	15
" " by especial order of B. of H., -	...	...	2	11	3	7	23
Certificates withheld by B. of H., - - -	1	1	1	8	1	1	13
	131	128	102	308	137	115	921

Percentage of Certificates withheld by Board of Health, .014.

AGES OF MEN WITH DICHROMATIC VISION.

Engineers, 29, 31, 32, 31, 39, - - - - - average, 32$\frac{4}{10}$ years } 31.
Firemen, 24, 31, - - - - - - - - " 27 " }
Conductors, 27, 65, 50, - - - - - - - " 47 "
Brakemen, 53, 28, 33, 20, 22, 28, 21, 28, 22, 23, - " 27$\frac{8}{10}$ "
Switchmen, 26, 55, - - - - - - - " 40 "
Station Agents, 64, 25, 31, - - - - - - " 40 "

In view of the opposition to the methods of examination and the adverse criticism to which they were subjected, in most instances made by persons quite unfamiliar with the examinations as practised, based upon the exaggerated or entirely false statements of interested or prejudiced parties, and entirely ignorant of the subject of optics as applied to vision, I may be permitted to state that the standard for visual acuteness is that adopted the civilized world over as the standard of normal vision for the last twenty-five years. It was arrived at by a series of examinations of many hundreds of eyes carried on impartially as to the result, with no other idea whatever than that of arriving at a strictly scientific and accurate and positive result. This result was confirmed by other independent investigators working in an entirely different way by actual measurements, and no change has been made since; they are accepted by all scientific physicians as fixed and positive. The standards for testing this acuteness have been, and are, in practical daily use by all physicians practising in ophthalmology for arriving at the vision of their patients with confessedly diseased eyes; striving always in case of any reduction of the vision below that standard to bring it up to it, and feeling when unsuccessful, that the patient's vision has not been fully restored. Whatever difference of opinion there may be as to the standard is that it is not high enough rather than too high. It was reserved for the counsel of the employees seriously to propose, so to interpret the law that normal vision could be defined to be a sliding scale depending upon the occupation of the individual! In other words, that the shape of the railroad employee's eye might be different from that of the farmer, or that of the farmer different from that of the shoemaker or other tradesman.

When the International Medical Congress at Amsterdam, in 1879, adopted the rules for the examination of the personelle of the railroad and marine services, presented by Professor Donders, the first living authority as to what constitutes normal vision, neither they nor he asserted any new standard for vision; they simply formulated for practical purposes well-established laws in Ophthalmological science. It was in the same view that the American Ophthalmological Society, composed of the first Ophthalmologists of this country, at their meeting at Newport this year, approved your rules and requirements.*

* See transactions for 1880.

During this year, also, the British Medical Association held at Cambridge in August, and the International Ophthalmological Congress at Milan, in September, both passed resolutions advocating a compulsory examination of the vision of all persons in the land or sea services who are obliged to see clearly or to read color-signals. These associations will never advocate nor permit that the standard for normal visual acuteness shall be anything less than the first adopted by your board. Indeed, it is because of the certainty and fixity and universal recognition of that standard, that they venture to make such a suggestion at all. Recognizing that unsuspected defects of vision may be a source of danger, they advocated the only possible way for detecting them with certainty.

The third rule, page 7, of your printed instructions, relating to five years of service, gave to trained employees all the security necessary, to enable them to retain their positions, if proved capable by the testimony of the officials of their respective roads. No one wishes to deny that an engineer, even if his vision is defective, who has worked industriously and faithfully, with the pride which all men feel in meeting fully all the responsibilities of a difficult position, and has become perfectly familiar with his road and its signals under all conditions, thereby acquires a sort of automatic sense of how everything should be, that may take the place of better vision; any change is to him at once a warning. This is not good vision, however; it might fail him in exceptionally adverse circumstances, and would not serve him on an unfamiliar road. He would then be an unsafe man for his train, and it is quite doubtful if such an one could get employment, *if his defect were known*, unless his record for care and judgment were exceptionally clear; and herein is an unfairness to the railroad officials in that the certificates as modified and issued do not state what the vision of the bearer actually is; they cannot know exactly what they are dealing with when they engage or continue him in employment.

If properly enforced, it would put the responsibility where, under the circumstances, it rightfully belongs. *Certificates* to those men should never be issued without a written assumption of responsibility by the officers of the roads employing them.* It is certainly not fair to the traveling public, (to say nothing of the law) to jeopardize their lives, by putting them in charge of an engineer

* No certificates were granted engineers without a guarantee of fitness by experience, training, and character to perform their duties, from the railroad officials. C. W. C.

with defective vision, unless those employing him will assume the full responsibility; so that they cannot plead in defence of damage that they did not know of the man's defect, and had no means of learning it until he had shown it in the destruction of life or property. Every one assumes on entering a train that his engineer has good vision; let it be honestly advertised on the time-tables that the engineer of a given train has less than normal (not "modified") vision, and I doubt not it would soon be shown what the view of the traveler is upon the question; whether he would prefer the "theoretical" standard of science or that which has no better basis than the endorsement of the railroad officials to the petition of the employees as presented to your board.

The conditions of normal vision are such, that an object the size of the test-letters employed, if carried farther away than the 20 feet distance at which the men were placed, becomes too small to be seen by the normal eye—if so seen (and there are many who can see it at a greater distance) that eye has more than normal acuteness. The object must be correspondingly increased in size to be seen at a greater distance, and it is a simple matter of calculation to learn how large an object must be at any given distance to be accurately defined. The test-letter is $9\frac{1}{2}$ millimeters square, the lines composing the letter being just $\frac{1}{5}$ of the height. The corresponding object at 80 rods (1,320 ft.) must be nearly 2 ft. ($23\frac{1}{2}$ inches square) to be recognized—the eye which cannot see the test-letter at 20 ft., but requires the "two-thirds" letter cannot recognize at that distance an object less than 3 ft. (35 in.) square. It cannot with certainty tell the difference between a rock of that size or a comparatively innocent object, if the latter be still, or does not have some distinguishing mark other than its form; and if the vision is but $\frac{2}{5}$ of the standard—such persons cannot see to define an object on the track at the 80 rods, if it be less than $4\frac{1}{2}$ ft. square. If the condition of the atmosphere is unfavorable, if the sun is shining in their eyes, or the day is dark, or twilight approaching, they will not see it in time to stop their trains. It is not of course claimed that an engineer shall see in all conditions of the atmosphere, in daylight or in darkness, it is only claimed by the law that he shall be able to protect his train, so far as vision is concerned, as well as from 87 to 95 per cent. of people would be able to do.

As a matter of fact I know that to cases of "progressive disease," certificates were given. Employees holding important positions were

found with cataracts in both eyes—others with advancing retino-choroiditis—these were however only discovered by reason of their personal courtesy, in allowing me to examine their eyes at my office. It will, under the law, be for your Board to determine when re-examinations in these cases shall be made.

Most superintendents, in discussing this matter with me, have declared that they would not knowingly have a near-sighted man on a train, regarding him as dangerous. I found one such in a first-class position, and in all of the second-class grades of the service, in various degrees. In one instance the man was so near-sighted that he could not see distinctly more than $2\frac{1}{2}$ inches from his face. This man had got along for eleven years somehow, without having made accidents sufficient to lead to his detection, yet never without danger to himself, the company, and the traveling public. If the officials of the road had known of his defect they would not have employed him, but until this examination, there was no suspicion of his extreme defect. Although this is an exceptional case, similar of less degree occurred in both classes.

The opposite visual defect of long, or over-sightedness (*Hypermetropia*) is not to be confounded, though it usually is, in the minds of non-professional persons, with the "far-sightedness" of age (*Presbyopia*). Usually the effects of this defect first show themselves seriously when the person has attained the age of from 45 to 50 years, but then much more seriously than in the person with simple Presbyopia. The latter only has difficulty in using his eyes for near work, he sees at a distance as well as ever, while in Hypermetropia all his vision, for both distance and near, is indistinct; just as indistinct as the corresponding near-sighted defect, and only to be remedied by the same means, *i. e.*, the wearing of proper glasses. Now, while in the second class of occupations, your rules allow the use of glasses, they do not for obvious reasons allow them for the first class. Even if they did, the railroad officials would not trust an engineer to run their trains, who they knew was obliged to depend upon glasses to see distinctly—the consequence is, as the examinations showed, several men were running trains whose vision was so imperfect that they could not see to distinguish an object on the track double the size of one which a man with normal vision (87 % of their own number) could see accurately. Most of these men were aware of their defects, (I refer to those in whom the change had come on in later

years) and several volunteered to me the expression that they had thought for some time past that they ought to give up their work.

I shall defer a discussion of the visual defect called color-blindness (more strictly speaking, however, Dichromatism) for a paper to be found later. I wish to recall to you, however, the statements made when presenting my report on September 30th, that I did not permit myself to be influenced in my judgment, as to the defect in any given case, by the absurd so-called *tests* with the flags and lanterns. Tests they were not, in any proper definition of the term. As examinations I reported them accurately, but inasmuch as I would have regarded it in the highest degree unreliable to have condemned a man on so utterly crude an examination, with instruments of such variable action, and under circumstances that deprived them of all accuracy, so also would I have regarded myself as derelict to the duties of my office, if I had expressed an opinion favorable to one who had passed successfully an examination, where the chances of guessing rightly were in the man's favor. The record of every one's examination was correctly reported.

I wish here to call attention simply to one fact as shown in the tables, that among those in the first class found deficient in color-perception, but *one* was over 32 years of age, the average age of those thus affected being just 31 years. With this exception the defect was in this class only found among men considerably below the average age of their class, which is $36\frac{1}{5}$ years. Now the "practical" railroad official objects to the tests employed for detecting this defect as too "theoretical"—that the men don't understand them (!), and that they ought to be tested with the "tools of their trade," that they (the officials) do so test them sufficiently, and if a man passes their examination he is sufficiently free from the defect to be able to run his engine safely. That *they* can find out if there is anything wrong with his sight. Reserving, as before stated, for a future article what is to be said of the *unsuspected* nature of the defect, I beg leave to suggest that the youth of the men with this defect goes to show that though the tests applied on the roads are too crude, too uncertain to ever detect the defect as such, these men are actually eliminated from the service before they reach the average age of their class by a further experimentation with the lives of passengers and the property of the corporations. At how much sacrifice of life and property we are unable to say. Is the law or the tests which serve to avoid this sacrifice then unpractical?

In further illustration of this point I beg leave to call your attention to the results obtained on the New Haven and Northampton Company's road. That road running into Massachusetts, the officials had, so I was informed by the President and Superintendent, adopting the suggestion of the railroad commissioners of that State, "tested (?) their own men sufficiently well, and there were no color-blind men on their road." By the tables above given, it will be seen, *first*, that the proportion of employees presented for examination, was much *smaller* than that of any other road coming under my observation, *i. e.*, less than 20 per cent., as against 33 per cent. and over on all the others; and, *second*, that the proportion of those having the dichromatic vision was *greater*, by nearly double (.071 per cent.) than that of any other! On inquiry as to the method employed, I found it to be so utterly crude as to be worse than valueless, (as the result of my examination showed.) being carried out or suggested, by some one without the slightest idea of what the vision of persons afflicted with dichromatism really consists.

This ought to show the advantage (necessity) of having the examination at least under the control of those having a scientific knowledge of the subject. In this view, I desire further to state, that the examination by experts is a security to the employee with normal vision; because such an examiner can always distinguish between the "color-blind" and the color-ignorant. I have had several men presented to me with the warning that such an one was "color-blind," and in but one instance did the prediction prove true.

In conclusion, I beg leave to acknowledge the uniform courtesy with which I have been treated by the officers of the various roads. Unnecessary as many of them believed the law to be, and always involving some interference with their work, they gave me every facility I asked for, and were evidently desirous to have every man examined who came within the law.

I am very respectfuly, your obedient servant,

W. H. CARMALT, M. D.,

One of the Examiners.

The following is a summary of the two reports:

Whole number of employees examined,		1,950
Consolidated Road (N. Y. & N. H. & Shore Line),	685	
New York & New England,	452	
Housatonic Railroad,	141	
Naugatuck Railroad,	105	
New York, Boston & Providence Railroad,	133	
Connecticut Western Railroad,	98	
New London Northern Railroad,	76	
New Haven & Northampton Railroad,	70	
Connecticut Valley Railroad,	59	
Air Line Railroad,	45	
Danbury & Norwalk Railroad,	34	
Shepaug Railroad,	28	
Derby and New Haven Railroad,	21	
New Canaan Railroad,	3	
	1,950	

NUMBER IN EACH CLASS.

Engineers,	291
Firemen,	285
Conductors,	202
Brakemen,	635
Station Agents,	212
Flagmen and signalmen, and switchmen,	325
Total number refused certificates finally,	29
Number leaving their occupation voluntarily when found defective,	9

By consultation with railroad men it was found that the position of brakeman in the middle of the train was not a very responsible one, and that hearing was there more important than vision, as he acted only when signaled by the whistle—or at least almost invariably. Certificates were therefore ordered to many for that special position. Other special certificates were granted for one position alone, experience having demonstrated the capacity of the employee. A list was kept of all such special cases for future re-examinations, at a not very remote period if required.

In other cases where the railroad officials were willing to endorse the man, and employ him if relieved from the liability of a fine, and would so state in writing, special certificates were given when the defects were not too great. In all these doubtful cases the

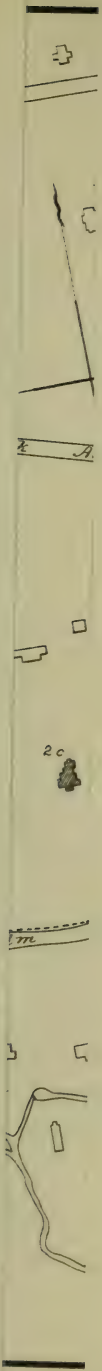
matter still lies in our hands, as we can order a re-examination whenever the exigences of the service demand.

It is not exactly known the number whose occupation was changed by the action of the Board, but the number is larger than the total rejected cases. In all cases where certificates were granted men with progressive disease, a record of the man's condition was taken and a re-examination before in the nature of the case any liability to danger will arise can readily be ordered. As before stated, the whole subject is somewhat experimental as yet; nor is there any universal agreement as to the limit of vision requisite for safety in experienced employees.

TYPHOID FEVER.

The localized epidemic of typhoid fever in South Manchester this fall, and the prevalence of typhoid fever along the valleys of the tributary streams of the Hockanum, as well as of the valley of that river, and of other forms of zymotic diseases, indicate some local cause to account for their frequency. The large number of malarial cases might be more readily ascribed to a natural condition favorable to its existence and spread, caused by the interference with the natural drainage of the region by the frequent pondage of the water by numerous dams along the course, at every available point, for a water supply for manufacturing purposes. The prevalence of typho-malarial fevers, together with typhoid, moreover, strengthens the theory of pollution of either water, or soil, or both. A brief account of the outbreak at South Manchester is given, with a map of the region, showing the location of each case, and the streams and sewers. This map was constructed by Messrs. Burdette & Gager, drawn from a map kindly furnished by the Cheney Bros. Apparently no place ought to bë healthier than South Manchester, and there are few places where greater attention has been paid to sanitary matters, and general cleanliness of the village and its surroundings. The soil, however, is a sandy loam; the depth of the sand is not well known on the upper part of the plain, however, a brook loses itself in the sand soon after striking the plan.

There is in many instances pollution of the soil and infiltration into the wells, the resultant of long years of occupancy. The town is sewered to a greater extent than is ever met with in towns of its size in this State, and the exemption of the sewered portion is as marked as the preponderance of cases where a sewer empties in an open field in the sandy soil—two furrows being turned back to form a sort of ditch. Nearly every house in the vicinity has cases, and the mortality is indicated by the figures. The houses on higher ground also show exemption, as is very generally the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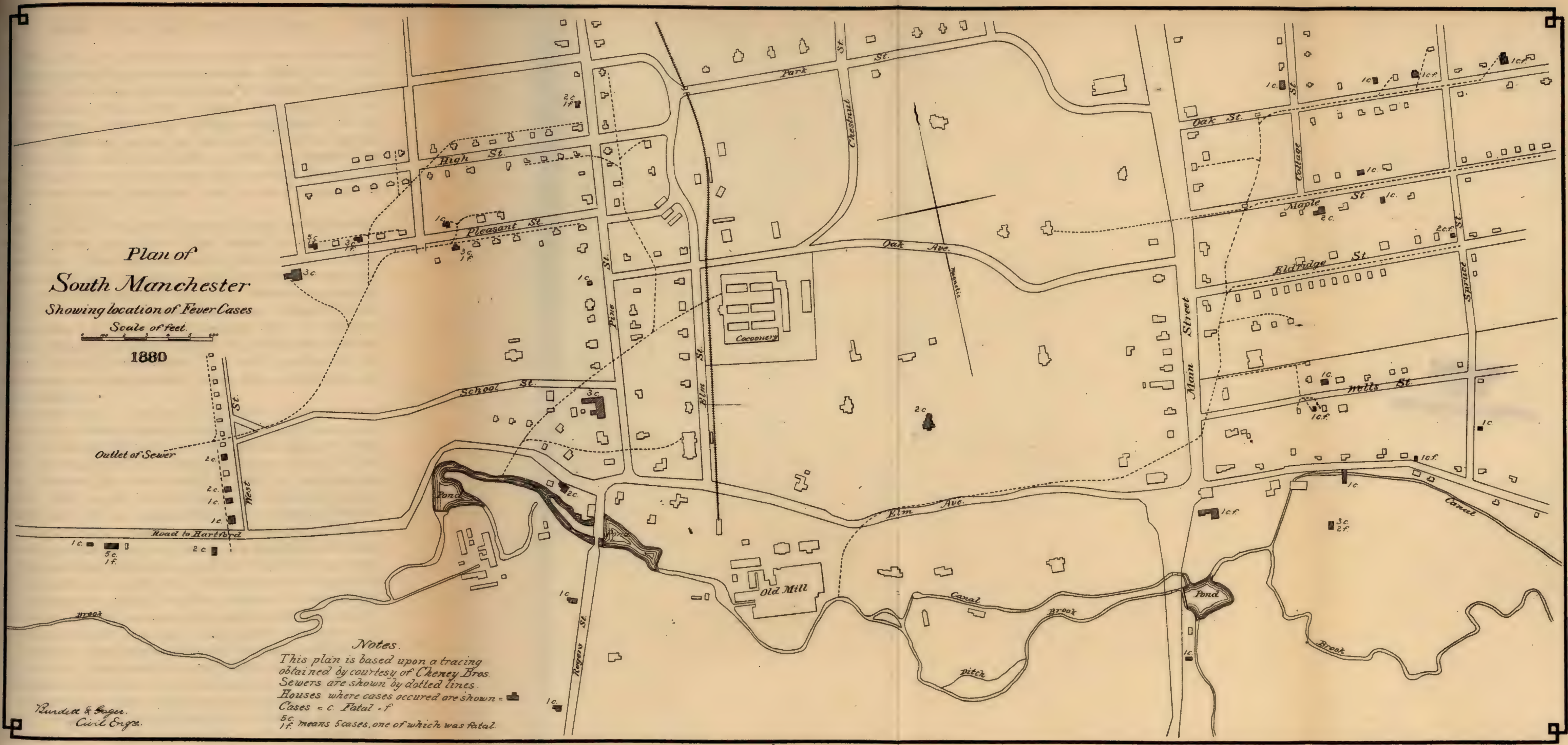


AM. PHOTO-LITHO. CO. N.Y. & BOSTON (OSBORNE'S PROCESS.)

case. Wherever typhoid fever is found it is oftener on ill-drained or low levels, in the valleys or near swamps. There were, in the area shown by the map, sixty-three cases of typhoid fever from July to December, 1880, fifteen of which were fatal. In 1879 there were many cases in this vicinity—several taken into the hospital at Hartford; as was the case this year, so the specific virus of typhoid fever was not lacking; indeed, the disease is endemic along the valley, and as the germ or virus preserves its vitality several years, importation is not needed to originate the disease.

These cases above referred to occurred almost wholly among a colony of Swedes, a portion of whom landed in June from an emigrant ship. The first cases were in the latter part of July, and the shortest fatal case lasted a week; convalescence was slow, relapses not uncommon, the tendency to hemorrhages marked. Many of the cases were apparently typhus, presenting all the characteristics. In many, the symptoms were very peculiar, although they were distinctly typhoid, no intermittent elements to show malarial complications. In other portions of the town, malarial and typho-malarial fevers were nevertheless more or less prevalent.

The brooks shown in the map are polluted to a greater extent than any other bodies of water in the State that have come to our notice. In summer they are often offensive to sight and smell, and are so contaminated as to destroy any forms of fish life, and in many instances the water cannot be used for manufacturing purposes. The streams are polluted by the refuse from paper-mills that use wood, etc., necessitating tons of waste, and from the extensive silk-factories, especially from the cocoonery, from whence enormous quantities of organic matter and chemicals are passed daily into the brook, which is but a few feet in width, but generally quite deep, and of a rapid flow. This waste is of a deep black color, and stains the water for a great distance, for several miles below the mill, and is found deposited upon flats and shallows, and stagnant pools, as well as along the banks of the streams for miles below, until the water reaches the next source of pollution. In the fields below West street, for a long way, the water appears like a thick black gruel, and is so turbid that but at little if any distance it is transparent in a glass dish, less than a quarter of an inch, instead of sixteen to twenty inches, as is the case in pure water. This flocculent mass held in suspension is nearly all organic; the

salts are held in solution, or else precipitated by portions of the organic filth. A stick stirring up the bottom of this brook shows a deposit of several inches in thickness upon objects in shallow pools along its course, *e. g.* a flat rock, while large quantities of gases are disengaged. The putrefactive gases can be seen bubbling up through the water, oftentimes the resultant of decay of organic substances.

The sewers nearly all empty into the brooks, and in the better houses water-closets and a full supply of pure water is found. Thus, in addition to the manufacturing waste, we have sewage contamination. During its passage through South Manchester, the brook receives a greater amount of contamination than a stream five times its size could dispose of safely in a run of five miles, but after a short run this brook is again polluted, and discharges into a stream that already has its sufficiency of pollution before finding its way into the Connecticut.

Whether the local conditions here found caused this epidemic or not cannot be fully determined, as we do not know exactly the influences the emigrants were exposed to upon ship-board. They were not likely upon an emigrant ship to be the most hygienic that could be imagined, and the typhus element indicates some influences of this sort. However that may be, the cases were not confined entirely to these emigrants, although the greater part were Swedes, and if the disease was not caused by the local conditions, they could certainly not have lighted upon much more favorable conditions for the causation and spread of typhoid fever than is to be found in the open sewer in the rear of West street. In these cases too, nearly every one worked in the same mill, the one containing the cocoonery, and thus were subjected to the same local influences. Whether entirely due to local influences or not, the health of the locality requires in the first place that the sewers should have an outlet other than upon the sandy plain, and that the pollution of the stream should cease. There can be no better commentary upon the influence of unsanitary conditions than the diseases that prevail along these valleys, and the typhoid type that is so readily engrafted upon every variety of disease. The prevalence of malarial diseases depends rather upon the retention of the ground water, but by purification of the stream the healthfulness of the whole region would be improved.

This can be rendered profitable, as well as beneficial. The quantities of fertilizing elements that go to waste is seen in the

dense growth of coarse plants along the course of the stream that in their turn shade the soil and cause an unhealthy dampness. If the manufacturing waste were allowed to settle in large tanks before the water was allowed to enter the stream, or better yet, precipitated by lime or some other cheap chemical salt, a valuable fertilizer might be produced. Or better yet, if all the sewage were collected into one trunk-sewer, and were together with the manufacturing waste conveyed upon the waste sandy plains, these might be rendered most highly productive, and immense crops of grain or hay result from that which is now only a curse to health and an eyesore in what is in all other respects almost an earthly paradise. The vile stream that crawls like a foul snake through this beautiful region should be purified, if only for the added element of beauty a clear, limpid stream would give to the landscape; when increased health and wealth as well would be the resultant, it seems strange that such a condition of affairs is allowed to exist for a day.

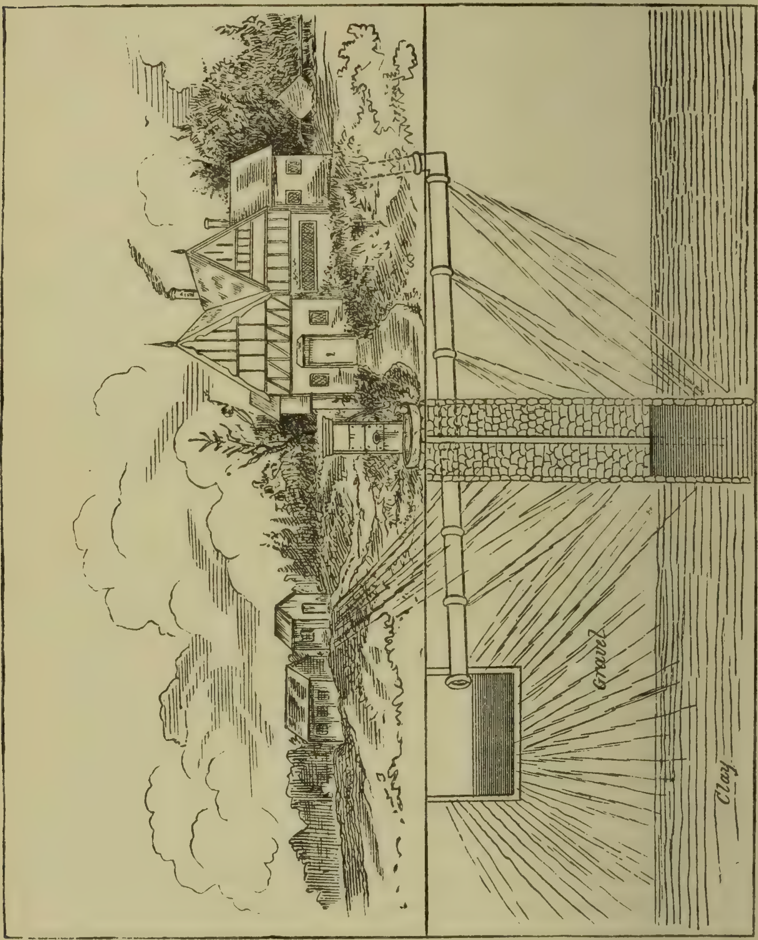
Typhoid fever is endemic in this State, but no other local epidemics are reported this year. In view of its importance and prevalence, a pamphlet concerning its restrictions will be prepared.

RESTRICTION OF TYPHOID FEVER.

As typhoid fever is one of the endemic diseases of this State, often manifesting itself in local epidemics of greater or less extent and severity, it has seemed wise to endeavor to diffuse a little more certain knowledge concerning its causation and prevention.

Typhoid fever is a type of the group of diseases to which the name *filth-diseases* has been given; in brief these are thus named because they are spread by excremental filth and sewage, and rendered more malignant, if not directly produced. Indeed, a fever scarcely if at all distinguishable from typhoid fever is doubtless directly produced by such emanations. However disgusting it may be, it is doubtless true that typhoid fever may be received into the system by inhaling through the air we breathe, or swallowing in the water we drink particles of *fœcal matter* that had their source in a patient sick with the typhoid fever. The evidence is conclusive that the choleraic dejections dried and scattered through the air by the winds have produced wide-spread epidemics of Asiatic cholera. No less conclusive is the evidence that the dejections of typhoid fever patients that have found their way to the air we breathe or the water we drink have, in numerous

instances, caused cases or even epidemics of typhoid fever. So plain is this evidence, that epidemics have been traced to the milk of the dairyman diluted with water thus contaminated, or, at least, the pans and utensils washed in such water, as in the epidemic at

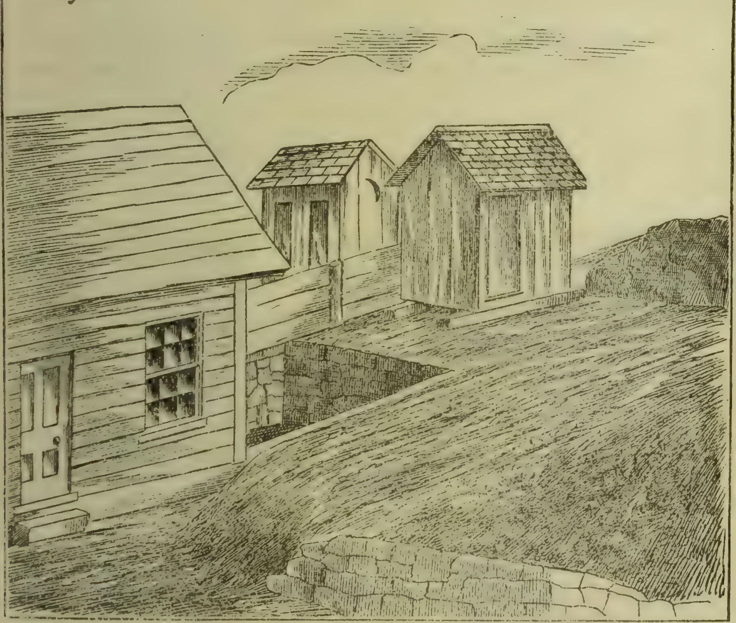


Parkhead, described by Dr. Russell. Near London, 500 cases were thus caused in 104 families, 96 of which were supplied with milk from one dairy; the contamination in each case was traced to contaminated water by typhoid dejections. Instances might be multiplied to any extent. Milk has also been a vehicle for the conveyance of other diseases of this class, as diphtheria, for instance.

The cases where the well has been thus poisoned and become a vehicle for the transmission of this disease, would, if all collected, fill a good-sized volume. An illustration of one or two, however, may be of service in fixing the facts in mind.

In the house shown in the foregoing illustration, there was a severe, in fact fatal, case of typhoid fever; the dejections were thrown sometimes into the cess-pool, sometimes into the privy-vault. It will be seen by the illustration that the drain leading

Fig 6



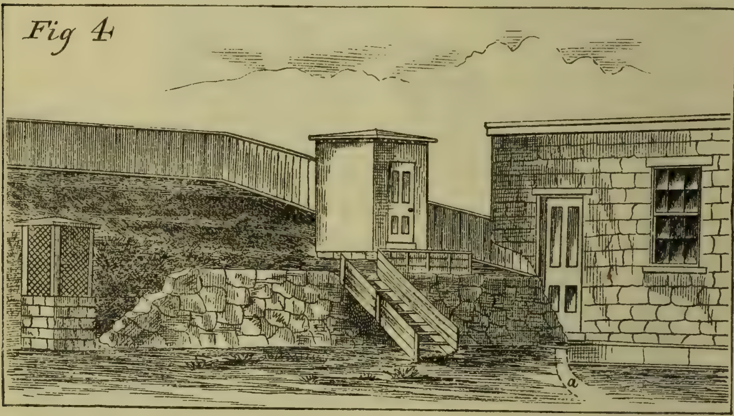
to the cess-pool passes the well, and is laid with loose joints in a gravelly soil with a clay substratum. The water from the well was thus easily polluted from both sources. The water from the well was used by several neighboring families, and by relatives who came several months later to visit the family, and by servants engaged for the increased summer work. In ten of sixteen who used the water of the well, typhoid fever ensued with a fatality much above the average.

The second illustration is of the apparent production of typhoid fever directly by filth. There was no traceable connection with

any preceding case. The well is not shown here; it was on a level with the house, five or six feet lower than the privies, and about equally distant from each; between them and the house. A fatal case of typhoid fever occurred here. It is difficult to eliminate contagion from a preceding case, as this may be preserved for years, and then act with, if anything, increased vigor. An instance of that was afforded lately, when the contents of a vault that had not been cleaned out for fifteen years, at least, was emptied, and the contents spread upon the land where a heavy rain washed portions into an adjacent well, the water from which started an epidemic.

The instances are so numerous, however, where cess-pool fever, as it is sometimes called, has arisen directly from polluted water,

Fig 4



air, and soil, that the possibility of such causation must be allowed; whether such cases are to be called typhoid or not is immaterial. The preceding illustration is similar, the danger of the pollution of the well water is very evident; here however, we have the combined influence of vault and drain. The sleeping-room of the patient opened a few feet above the window shown in the picture. These are not fanciful sketches, but drawn from real life.

In another case that came directly to my notice, the cess-pool was but a few feet from the house, with a lead pipe leading from the sink directly into it—the cess-pool was unventilated, and never cleaned, as the watery portions drained away in the gravelly soil. The chamber occupied by the patient was directly overhead—in the healthy, open country, this death-trap was ingeniously constructed.*

* See circular on rural hygiene.

Typhoid fever then is an infectious disease; the dejections from the sick, unless disinfected, can contaminate the water, air, and soil, and thus perpetuate and reproduce the disease. The possibility of the disease being *inhaled* from the receptacles where the typhoid dejections are placed must be borne in mind. There is danger if the dejections be thrown upon a refuse heap. "A villager who had contracted typhoid returned home, where there had been no typhoid for years; the excrements were thrown upon a dunghill; several weeks later five persons were employed to remove this heap, four were soon afterwards attacked with typhoid fever, the other with"—symptoms like it. The excrements of these five were buried deep in the same heap. Nine months later of two persons employed in completely removing this heap, one died of typhoid fever.

It attacks all ages, but especially those in youth and the prime of life; hence, its ravages are most detrimental to the State. Eighteen in every one hundred attacked die; the mortality rapidly increases in persons over thirty as age increases. It appears in all seasons, but is more frequent in autumn. It has of late become more especially a disease of the country rather than the city, especially if the cities have an abundant supply of pure water, and are well sewered, otherwise we find typhoid fever as prevalent in the city as in the country. One attack is a partial protection against a second. Some persons and families are peculiarly liable to the disease.

Allusion has already been made to care in spreading the contents of infected vaults on fields. Near Stuttgart in 1871, the meadows were manured with sewage; the aqueduct supplying the city was partially supplied from these meadows; rain fell January, 1872, carrying organic matters from the sewage into the aqueducts. In those parts of the city thus supplied, typhoid raged so extensively that there was a patient in every other house, while not more than usually prevalent in other parts of the city.

Where water-closets are supplied from a cistern that furnishes drinking water to the house, the supply should be *direct.* Roth mentions an instance where the evacuations of a typhoid patient were thrown into such a closet, the pipe of which passed to the cistern—no less than eight persons were thus infected. The air between the closet and the cistern is in such cases always foul, and this air must bubble up into the cistern before any water can descend.

Soil-pollution has been instanced. The most striking case is that of Munich, where the filth is thrown upon the ground and upon adjacent fields; typhoid is markedly prevalent, and unusually fatal. The usual practice in villages, and even in large towns and cities, too often is to secure a supply of water for drinking and other domestic uses upon the premises, usually from a shallow well. In the small lot upon which the house stands,—and the larger the village the smaller is this building-lot,—three holes are dug in the porous soil; one is used as a privy-vault, one to receive all the waste and filthy liquids from the house, the other to pump drinking-water for the family; these are often but a few feet apart—ten or twelve feet is no uncommon distance—even if they are as far separated as the limits of the lot will allow, they are in many cases dangerously near, and similar receptacles on adjacent lots add to the evil. The privy-vault and cess-pool are seldom cleared; often when the vault is full, a new site is selected near by and the old covered with a little earth, while the porous nature of the soil is relied upon for the latter; soil-pollution and contamination of the water is only a matter of time. To this must be added the soaking from surface-filth which drains into the well. Unfortunately, the soakings from excrement after passing through a few feet of soil do not render the water unpalatable, nor are germs or virus of disease separated, as shown by the numberless epidemics thus caused. The influence of the ground, air, and water have been shown in a preceding circular on rural hygiene; how readily they become contaminated is easily seen. "Privies and privy-drainage with their respective stinkings and soakings, and the pollutions of air and water which are thus produced, have in innumerable instances been the apparent cause of outbreaks of typhoid fever, but further, they have seemed capable of doing this mischief in a doubly-destructive way; first, as though by some aptitude which other nuisances of organic decomposition, though perhaps equally offensive, have not seemed equally or nearly equally to possess, and, secondly, as though this specific property so often attaching to them, in addition to their common septic unwholesomeness, were not even in them a fixed property. The explanation lies in their liability to carry with them the specific *contagion* of any bowel infection." The whole subject of soil-pollution is fully presented in the essay by Prof. Lindsley in our second report. The effect of defects in public sewers and leaky house-drains is there fully discussed; they can only be mentioned

here as a frequent source of soil-pollution. The evils that result from large vaults thirty to fifty feet deep have been fully demonstrated in Memphis and other cities, and are mentioned as instances of folly not likely to be repeated.

PREVENTION AND RESTRICTION.

The most general method of diffusion of typhoid fever is through the dejections of the sick; by these, too, the specific contagion of the disease is preserved for an indefinite period in uncleaned vaults and neglected refuse-heaps. It is uncertain, even in the soil, how long the contagion preserves its vitality—instances are on record where the contagion has been conveyed two miles through underground water-courses, and then produced the disease.* To trace the connection, various chemical salts were placed in the water, and in due time they appeared in the distant brook. Of course such salts were selected as were soluble, but not found in that vicinity, or country even. Various experiments to prove contamination of well-water have been made; the shortest time in which a substance placed in a cess-pool found its way into the adjacent well that has been recorded is fifteen minutes. Often after several hours a salt thus placed is found in the well. The time depends upon the distance, nature of the soil, and the channels of communication that have been established. The danger of infection from the dejections of the patient being granted, the most obvious means of prevention is to disinfect all discharges from the bowels. These should be received in vessels containing a pint or more of copperas or zinc solution—the latter is more cleanly, as it does not stain, and fully as efficient; it is however more expensive. The copperas costs but a trifle. The vault where the dejections are cast should be disinfected daily with at least a gallon of the copperas solution, or, if poured down a water-closet, the solution should be freely used after each deposit. If this plan were thoroughly followed, the specific contagion of typhoid fever might be stamped out.

POLLUTION OF SOIL AND WATER.

This can readily be prevented, if the waste products are used to nourish vegetable growth, instead of allowing them to accumulate in deep receptacles, where nature's processes are rendered

* Purification of water-carried sewage.—*Robinson.*

inactive. Every house, almost, has lawn enough to dispose of the kitchen waste; if it were conducted a little below the surface in porous drain-pipes over the whole area, the grass-roots would soon render it harmless, nor would there be sufficient accumulation in winter to pollute the soil—or, the drainage from the sink could be conveyed to the garden and then led from point to point in shallow trenches, thus used as a fertilizer, instead of contaminating the sub-soil. If a cess-pool be inevitable, the bottom and sides should be cemented; it should be well-ventilated, and often cleaned and emptied. The liquid contents may be conveyed by a drain leading away from the well and some distance above the bottom, so the solid matters may settle; these should be carted away.

The privy vault should be cemented, and ventilated by a pipe running to the roof of the building, and often emptied and disinfected. When emptied, lime may be used freely—the copperas solution is the best to disinfect and deodorize its contents, and should be freely used in the summer months. Where practicable, the use of dry earth is strongly recommended. A very little care in this respect will remove all annoyance and danger. If an automatic hopper be thought too much trouble, a heap of earth may be placed in the rear, and a little thrown in with a shovel every day. The sides and bottom of the vault should always be cemented, for cleanliness and ease in removing the contents. Where this plan is pursued, a hinged door for the rear wall of the vault is a convenience. The earth thus used should be covered to keep dry, and if used freely can be used repeatedly. For indoor use in the country, especially in winter, the earth-closet is recommended. One can easily be improvised, and wood or even coal-ashes used in place of dry earth. For villages, the pail-system has proved successful, and the plan is self-supporting after the first outlay. The fertilizing value of the material pays for the cartage, or very nearly. In this plan a set of tubs is provided. These are removed regularly, and an empty clean one set in its place. The plan requires combined action, but a few can inaugurate the plan, when its advantages will soon induce others to join. The only way to prevent contamination of soil, air, and water is to remove all waste before putrefactive decay sets in. The use for such waste is to nourish plant-life, as by nature's chemistry the old is constantly reconverted into the new. One advantage of the pail-system is, that a plan for garbage removal can readily be combined with it. Decaying heaps of garbage are almost as

offensive as excremental nuisances, and, unfortunately, in our cities and towns too little care is manifested in removing garbage. With ashes and other refuse, it is used in filling depressed places—coves and the like. Too often is disease and death the result of building upon land thus made. Fermentation and putrefactive decay takes place in such land for at least seven years, and such emanations are deadly.

The ease with which drinking-water is contaminated with the specific contagion of typhoid fever emphasizes the care that should be used in disinfecting all typhoid dejections, and in their ultimate disposal, and the importance of securing a pure, uncontaminated water-supply. Typhoid fever diminishes in frequency in nearly exact ratio with the success in securing pure water, and a complete and rapid removal of filth. A wet, undrained location with damp, misty exhalations from the soil, as a matter of course, predisposes to typhoid fever, but it is more influenced by the ground-water, as that becomes polluted.

The principal points may be thus summarized:

Typhoid fever is an infectious, self-propagating disease; the living body of the infected person is the soil in which the specific contagion which causes the fever breeds and multiplies. The contagious matter by which typhoid fever is mainly perpetuated is cast off chiefly in the intestinal discharges. Privy vaults and other receptacles of these discharges become the medium of transmission of the specific poison. Once cast off this contagion acts in two ways, either contaminating drinking water or infecting the air. On account of the vitality of the contagion, its minuteness, and the multitude of ways in which it may be transmitted, it is often untraceable. By destroying the infective nature of the discharges the spread of the disease may be prevented.

The discharges infect the air of the sick-room, the bed and body-linen of the patient, the privy-vault or other receptacle into which they are thrown. From the privy-vault the poison often sinks into the well. When this happens it is the most deadly of all forms of fever-poisoning. A rubber sheet should be placed under the linen sheet, over the mattress, to prevent the discharges from infecting the mattress, as well as for cleanliness. The hands of attendants may be washed in the zinc solution or bromo-chloralum.

Thorough ventilation of the sick-room is of the greatest importance. The dresses of nurses and attendants should be disinfected after the termination of the case.

In case of death the body should be at once placed in the coffin and disinfected. It may be wrapped in a sheet wet with a solution of chloride of zinc.

Cases of fever do appear where the evidence is apparently conclusive that they were caused directly by filth, without the intervention of a previous case. These are often called cesspool fevers, but they do not differ essentially from typhoid.

The rules for its restriction and prevention, in brief, then are:

1. Thoroughly disinfect all intestinal discharges from patients with typhoid fever.

2. Prevent pollution of water used for domestic purposes by fœcal impurities.

3. Prevent the pollution of the air and soil by filth, or the putrefactive decay of organic substances.

4. Secure a well drained site for a dwelling house, with sub-soil drainage around the outside of the cellar walls.

The disinfectants most reliable, as well as cheap are—

1. Copperas, 50 pounds to a barrel of water. Four gallons will usually be sufficient for a vault used by one family; afterwards a smaller quantity daily; one pound to a gallon of water may be used.

2. Sulphate of zinc, 8 ounces; chloride of zinc, 2 ounces; water, 4 gallons.

3. For boiling cotton and linen goods, one part chloride of zinc to two hundred of water. Burnett's Fluid is a solution of chloride of zinc.

The two latter do not stain, and have no odor.

It is not intended to decide any of the mooted points upon the etiology of typhoid, but simply to state facts that are known.

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The Air, Pettenkofer.
Water Supply, Brown.
Water Analysis, Eakin.
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Water Supply of Cities, Humber.
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Summer and its Diseases, Richardson.
Report Board of Health, Boston, Mass., 1879.
" " " New Haven, Conn., 1879.

Filtration of River Water, Kirkwood.

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Registration Blanks and Circulars, State Board of Health, New York.

Restriction of Diphtheria, State Board of Health, Iowa.

Sewerage and Drainage, J. J. Loring, Iowa.

Rules and Regulations for Iowa Local Boards of Health, Issued by the State Board of Health.

On Contagious Diseases, J. H. Raymond.

Measles not a Trivial Disease, J. H. Raymond.

Circulars from N. Y. State Board of Health to Local Boards on Diphtheria, etc.

On Disinfection, State Board of Health, Mass.

Report of Health Officers, District of Columbia, 1879.

Report City of Baltimore, 1879.

Quarantine Convention, 1880.

38th Registration Report, Mass., 1879.

Sanitary Drainage of Washington, Waring.

TREASURER'S REPORT.

Expenditures from Dec. 1, 1879, to Dec. 1, 1880, .	$2,044.95
Salary of Secretary, ...	1,000.00
	$3,044.95
Cash on deposit, ...	420.00
	$3,464.95
Bills outstanding, about, ...	$325.00

RECEIPTS.

Cash, ...	$3,000.00
Balance from old account, ...	464.95
Total, ...	$3,464.95

Approved,

C. W. CHAMBERLAIN, M.D.,
Treasurer.

C. A. LINDSLEY, M.D.,
Auditor.

DETAILED STATEMENT.

Printing,		
For Bureau of Vital Statistics,	$321.25	
For Sanitary Department,	106.13	
For Color Blind Act,	154.37	
		$581.75
Sanitary Engineers,		219.50
Photo-Lithographic Co.,		281.00
For Library,		355.38
Traveling Expenses,		361.25
Postage, Telegrams, and Express,		95.00
Sanitary Investigations and Analysis,		68.75
Stenographers and Copyist,		46.50
Stationery,		35.82
Total,		$2,044.95

C. W. CHAMBERLAIN, M.D.,
Treasurer.

I have examined the accounts of the Treasurer of the State Board of Health for the year ending November 30, 1880, and have compared them with the accompanying vouchers, and find them correct.

C. A. LINDSLEY, M.D.,
Auditor.

The amount expended in direct sanitary work is much larger than during the previous year. It must be remembered, however, that the fiscal year of the Board ends Dec. 31st, a month later, hence quite a portion of this belongs to the item "bills outstanding," that is, work under way, but not finished when the report was made. The same is true for every year, as work is constantly going on; some accounts will thus overlap.

It is earnestly recommended to every town to secure a systematic index of their records of births, marriages, and deaths from the commencement of the record. The best book for this purpose we have yet seen is Burr's Index on three letters, thus rendering reference to many similar or synonymous names easy. They are not supplied, from want of funds, partly, and partly because it is useless unless the towns will take the requisite action in ordering the records indexed. No other records deserve this more than those of births, marriages, and deaths. Many errors and omissions too might, and probably would, appear in time for correction.

REPORT

ON THE

Plans for Warming and Ventilating

THE

BRIDGEPORT SCHOOL-HOUSE,

TO THE BUILDING COMMITTEE OF THE BRIDGEPORT (CONN.) HIGH SCHOOL.

BY

ROBT. BRIGGS, C. E.,

Cor. Mem. Am. Inst. Architects, Mem. Am. Soc. C. E., Mem. Inst. C. E. (English),
Mem. Amer. Philos. Soc., etc.

PHILADELPHIA.

14

REPORT ON THE PLANS FOR WARMING AND VENTILATING THE BRIDGEPORT, CONN., SCHOOL-HOUSE.

BY ROBERT BRIGGS, C. E.*

To the Building Committee of the Bridgeport High School:

GENTLEMEN:—After a very full examination and consideration of the plans for warming and ventilating a proposed school-house at Bridgeport, Conn., I have to report upon them as follows:

A preliminary inquiry into the problem of warming and ventilating in general may properly be instituted before taking up the particular requirements of this school-house, or of the apparatus proposed to meet these requirements. And the first striking and noticeable observation to be made is that there has been either a degree of failure or at least a want of positive success in previous efforts, attendant nearly alike upon the best reasoned and most expensively constructed apparatuses, and upon those founded in absolute error or positive ignorance, or carried out in parsimony or in fraudulent cheapness. The *best* authorities are those who qualify their conclusions or deductions most happily, and the most competent experts are admitted to be those who are least satisfied with attained results and least positive as to expected ones. The appliances for steam-heating received their development to the most approved form of to-day, scarcely forty years since, from the hands of the late Joseph Nason, but the applications have not, with these forty years of experiment and experience, as yet taken any typical form, such as becomes the proper foundation of mechanical development. Success in any mechanical application is exhibited by the adoption of some definite type, like the compound marine engine, the western river engine, the locomotive, etc., which type is subject to modification and improvement from many hands without departure from the generic order.

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* Reprinted by courtesy of the author and of the Board of Education of Bridgeport.

It may be, from the physiological point of view, that ventilation is more important than warmth, but from an instinctive one, warmth is immeasurably more essential. Every animal will go to the limit of suffocation for the comfort of warmth. To meet the natural requirement of man as an animal, ventilation must be made subsidiary to warmth. Criminals, hospital patients, orphan scholars may be regulated to healthful ventilation, but independent legislators, audiences attracted by any species of entertainment, school-teachers in schools, workmen in shops, people in houses, insist upon being comfortably warmed despite all sanitary proclamations. All the world resents being "done for" on general principles, especially as to the liberty of being comfortable.

In our Northern United States of America the problem of successfully warming any room whatever in cold weather has been met in two ways: The close stove and hot-air furnace. Let us consider stove warming. Any room, nearly regardless of dimension, can and will be adequately heated by a stove whose capacity to burn fuel is in almost direct ratio to the cubic capacity of the room. While the larger rooms have an increase of cubic capacity more considerable than that of the surface to be heated—the former increasing as the cube while the latter increases as the square—yet is is found practically that the distribution of the heat presents obstacles in the larger rooms that nearly compensate for the advantage of smaller proportionate cooling surface appertaining to such larger rooms.

A stove may be and generally is placed at one side or one end of the room, not near to the window or outer wall, and yet by some natural process the room will be warmed to a tolerably uniform and comfortable temperature. Near the windows in very cold weather, the leakage of air and cooled descending currents may be found objectionable, to avoid which, in the extreme north, carefully closed joints and double sash are resorted to. In all climates there is some balance of discomfort which people endure rather than troubling themselves to remove the cause. The houses of Maine are nearly if not quite as comfortably warm as those of Georgia.

Adopting this location of the stove in a room, it will certainly, if large enough, adequately warm the room, and the inquiry now follows: in what way does it do so? Some portion of the heat evolved from the stove will be transmitted or radient, but the heat of the stove-surface is dark heat, and although the material, and

the surface upon the material, is usually such as will give out the largest proportion of radient heat due to the temperature—yet most of the heat will have been dispersed by the current of air which ascends around the stove. Even the heat which radiates from the stove will have been expanded without loss in passage through the air, upon the ceiling and walls, from which it will be taken up by the air-currents through contact. Some theorizers attribute great comfort and importance to the radient heat coming directly or by reflection from open fires, substances in active ignition, but none of them attach value to the radiations from stoves or dark-heated surfaces, where extended surface and comparatively low temperatures, at the highest not to exceed 400° to 500° Fahr., are recognized conditions for healthfulness.

Surrounding any stove in active operation, there exists an envelope of air gradually ascending, as it acquires heat, toward the ceiling. In what way does this envelope come to have any considerable thickness? Air is nearly a perfect non-conductor of heat; one particle of air does not, or at least very slowly, receive heat from another particle. As before stated, air transmits radient heat without absorbing it. Only the thinnest film of air can possibly be in contact with the surface of the stove at any instant of time, and yet it is only by contact that the air is heated.

In fact, the air does not, nor does any fluid, whether gaseous or liquid, slide upon a surface along which it passes. The movement is a rolling one. D'Arcey describes the movement of water in a pipe to be similar (but reversed) to the stripping of a glove from the finger, by turning the glove-finger inside out. In a similar rolling movement the sheet of air passing the stove comes to have definite thickness, and involves in its rolling process particles of air remote from the ascending stream. As a stone thrown into a pool transmits its vibrations over the surface, so any disturbance of a fluid body confined in an enclosure is transmitted and communicated throughout the fluid to its most distant part, with some relative intensity. There rises from the stove a current of air of considerable volume, acquiring, as it ascends, a nearly uniform temperature, but with a nucleus hotter than the general temperature of the room. This heated air endeavors to find its level next the ceiling, but to do so it must not be assumed to slide in under the warm air which it finds in contact with the ceiling. Instead of this, the interposition will be accomplished by a rolling action similar to that on the stove-surface, wherein one

set of particles rolls off and the other rolls upon the ceiling with mutual admixture and equalization of temperature in the process.

With the accumulating of a stratum of heated air next the ceiling a corresponding absorption from the floor-stratum must have occurred. The necessity for the stove at all is the presumption that some loss of heat must have been going on at windows and walls equivalent to the heat imparted by the stove. The windows and walls impart "cold" in the same way and after the same laws of convection as the stove imparts heat. In one part of the room the stove will have been forming an ascending current of considerable intensity or velocity all around itself, while at another part, the windows and cool walls will have a sheet of cool air of less velocity but of equal heat-value traversing them downwards. The most uniform distribution of heat will be effected when these currents become the most general, extensive, and consequently most moderate. Suppose the stove to have its position remote from the windows and cooling walls, and to be so placed that the average extent of window or wall-surface or exposure shall be equidistant from the stove; it can then be asserted that the column of hot air from the stove will, after rising, roll upon the ceiling and become intimately mixed and equalized in temperature with the air it finds there, and that the sheet of descending air from the windows and walls will roll out upon the floor and intermix with the air on that level, establishing an equality of temperature in that stratum. Within certain well-known limits of size or shape of room and with a close room, the lower 6 or 8 or 10 feet of height of the room will be heated by a stove in any weather, so that the differences of temperature within that height shall not affect the comfort of the occupant.

Where the stove employed is so small as to demand inordinate heating of its surface to impart the required quantity of heat, successful warming is secured by protecting the occupants from direct radiation by screens or inclosing envelopes which are found to accelerate the rising current of hot air. And this is done without very materially impairing the distribution of heat. And even when the sash are not very tight in the window frames, tolerable uniformity of ground temperature is reached.

It may be well to look at the effect of a leaky sash in an otherwise close and well-warmed room of a cold day. Suppose a window of 12 panes of 12″ by 18″ glass to consist of two sash of 3′ 3″ square, there will be 13 feet long of joint to each sash which

may be taken at $\frac{1}{32}$ of an inch looseness, or an entire opening of 5 square inches. Accept the average temperature of the air within the room to be 70° and of that outside to be 20°. Then the air within the room weighs 0.075 lbs. and that outside the room weighs 0.084 lbs. per cubic foot; 13.34 cubic feet of air at 70° and 11.9 cubic feet of air at 20° weighs one pound. Taking the height of the window to be 6′ 6″, the mean height of influx or efflux will be about 5 feet, when on the supposition of a close room, there would leak out of joints, near the top, about 5 cubic feet of air per minute, and leak in, near the bottom, the same quantity. The cooling effect of such a window from leakage of cold air at its sashes is only what is demanded to heat 5 cubic feet of air from 20° to 70° each minute. Its cooling effect from conduction or radiation is far greater. The worse result from the cold air leakage is the streak of cold air which is apt to traverse the floor near the window, comparatively unmixed with warmer air. And it is to be noticed that the leakages at sashes do not generally balance themselves by ingress at the lower part and egress at the top, more frequently (the room heated being in the lower story of a building) the cold air enters at all parts of the window, when, as the height of the column of heated air will run up to, say, 30 feet in place of 5 feet, the quantity of cold air (the foregoing supposition as to dimension and looseness of sash being accepted) entering and to be warmed, rises to nearly 25 cubic feet per minute.

While the adequacy of the close stove to effect comfortable warming can be made a positive averment, and the economy of this method of heating over all others is certain, yet the large majority of houses, dwellings or otherwise, are heated in our Northern United States by means of the hot-air furnace, and this heating is nearly equally successful with that of stove-heating. Comparative uniformity of temperature, certainly within limits of difference to which custom has habituated most people, is attained with the supply of hot air introduced on the side or back walls of a room, remote from the points where the heating effect is to be expended, that is, from the cold windows and cool walls. In general no provision whatever is made for the escape of air, and the inflowing hot air expels by leakages alone an equal amount of the normal air in the room. If not by leakages from the windows within the room, which in such case leak outwards only, then by escape through open or leaking doorways into halls or passages, and thence most frequently upwards into stories above, when the height of

the heated column considerably accelerates the velocity of efflux at the cracks of windows in those upper stories. The circulation of air and the distribution of heat in any furnace-heated room is strictly analogous to the process described as pertaining to stove-heating. Whatever direction of entry may be given to the air from the furnace register, it soon takes an upward flow, carrying with it by contact, more or less intermingled, an auxiliary stream of air derived from the general atmosphere of the room, while the downward currents against the window and cool walls give the direction to a general circulation by which alone some uniformity of temperature is established. In dwelling-houses the separation of rooms is more defined near the ceiling than upon the floor, the doors being headed down several feet below the level of the former, while they are brought down to the latter without break. This demarcation defines the heating effect of a stove or a hot-air furnace current perceptibly. Take two parlors with an open doorway between them, the furnace current being in one and not in the other of them. In the one the cool sheet on the windows and walls will derive its auxiliary supply from the hot air next the ceiling, and the floor current established thereby will have a much higher temperature than that occurring in the adjoining room. The one may be comfortably warm while the other is decidedly cold.

One of the earliest objections to furnace heating was the inadequacy of means for escape of air in quantities such as were needed for proper ventilation, and numerous attempts to provide eduction flues and registers were made. The combination of perforated ceilings or of "ventilating" flues in the upper part of the room was advocated and advised. Diagrams of rooms, sections, or plans were judiciously arranged with arrows or tinted clouds, but the practical result showed a lamentable perversity in the hot air. With little intermingling it would make a bee line from the lower entering to the upper escaping register, and form isolated cold circulations at the foot of cold windows or walls and isolated hot ones in the corners of the room near the ceiling. Besides this, the "systematic" ventilation most generally had separate ventilating (eduction) flues for each room with separate flues of discharge above the roof, and there was a propensity for one or more of several of these flues on the same building to overpower another, when a downward current of cold air would set up in such other flue, to the great discomfort of the occupant and discomposure of the designer.

Practice and experience has demonstrated to the constructor of

hot-air furnace apparatus that even with his hot streams from the furnace he cannot rely upon the establishment of efficient currents in flues or outer walls; he must protect the heat of his ducts on their passage, and place them upon an equality of resistance, not merely to give each of several flues the same motive force in heat, but also to prevent one or more from acting in the reverse direction as part of a circulation. It is not at all infrequent in extended heating apparatuses (either hot air or steam or hot water), to find air-flues with a down draft. [In such cases the casual examiner will often declare that cold air is *coming* from the flue—as the hand is not very sensitive to the direction of the current. By wetting the hand and holding it in the current, the *cold* side will detect the course of the air at once.]

There has slowly come into use, as a matter of luxury or fashion, in the more expensive houses, an open fire-place or low grate in combination with a system of air-furnace heating, wherein the heat of comfort is derived from the latter source; and it has come to be recognized that, without the use of the fire-place or grate, ventilation is in some measure promoted by the chimney-flue; the hot-air currents become efficient with larger volumes and with less intensity, and, besides this, the circulation within the room and the equal distribution of heat are, if not improved, at least not impaired. Only one or two of such fire-places are provided on each story, if not in any entire house, so that the difficulty of double ascending flues from one room, before alluded to, does not commonly arise. [We treat our well-warmed houses as a single room on each floor, if not as a single room in the whole house.]

In most, if not in all cases where an open fire-place is constructed in a room heated by a hot-air furnace, the hot-air flue is located in the same chimney-breast with the hot-air register, discharging near the floor, although with the provision of discharging along the side of the room at the end of the breast, in lieu of outward from the wall. The sole protection to prevent the air from the hot-air flue being sucked at once into the chimney flue is this arrangement. No trouble is found in the distribution of heat in a room thus provided with flues and fire-place, although the latter may be removing a quantity of air nearly equal, or sometimes in excess of, the air admitted at the hot-air flue in close proximity.

So much has been said in this report upon these common methods of heating not as the presentation of novel views, but to set forth clearly that the distribution of heat in these cases is

entirely owing to the cooling effect of windows and walls. Shut off the radient heat of a stove, and it is not warmest near the stove in cold weather. More than thirty years ago Wyman noticed and published that the air near a hot-air register was colder than the average temperature of the room.*

These preliminary remarks have been made so extended for the reason that before discussing the question of the Bridgeport School Warming and Ventilation it seemed desirable to demonstrate that distribution of currents of air in a circulation involving the whole of the air within any room was indispensable to the most favorable forms of apparatus for spontaneous movements, and by parity of reasoning become incident and necessary for other kinds of apparatus when smaller differences of temperature, and larger volumes of air to be moved, demand every economy of the effective force.

§ It is proposed to erect in the city of Bridgeport, Conn., a building for the accommodation of the public high-schools, in which there is to be on each of two stories six school-rooms, each to be occupied by fifty scholars. It is further proposed to ventilate these school-rooms with a supply of fresh air amounting to 30 cubic feet of air per minute for each pupil, in all moderate winter weather, that is to say, when the thermometer is above 20° Fahr.; but when a lower temperature is reached it is proposed to restrict the air supply to not less than 20 cubic feet per minute for each pupil when the thermometer is at zero, Fahr.

To accomplish this ventilation, the arrangement for introduction of air is to admit the fresh air after it has been adequately heated at an opening to be placed in the rear wall of the school-room (in each room) remote from the windows and cool walls. The effective cooling average surface of which, windows and walls, being as nearly equidistant from the point of admission as the form of rooms will admit. This opening for admission will be elevated above the floor to such height that the incoming current will not be thrown upon any person standing upon the teacher's platform, while the direction of inflow will be made towards the window and at the same time rising towards the ceiling, the air receiving guidance from the register-plates or from the duct leading to the register. And, in connection with this system of admission, the arrangement for extraction of air is to withdraw the cooler and

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* Wyman on Ventilation and Warming, 1846.

partially-vitiated air from the surface of the floor, through the entire opening of the riser of the teacher's platform. This platform being located in the rear of the room, and being, say, 12 feet in length and 6 feet in width in each case. This method of withdrawal is adopted with a view to take from the coolest stratum of air within the room, intercepting in part the flow of that stratum. The previous argument of this report has been to show that such a flow is incident to the general circulation necessarily accompanying any effective warming of any room, independent of any ventilating currents. It now becomes proper to consider whether it is desirable to use such ventilating currents to aid and promote the general circulation, or otherwise to use them to intercept and prevent this circulation.

It is nearly impossible to apply any figures to the velocity of currents which would result from this arrangement; it can only be said that, involving the complete contents of the room (if the desired movement is successfully attained), they are the lowest possible for thorough distribution. Some approximation may be made, however. The proposition involves 30 cubic feet to fifty scholars, or 1,500 cubic feet of air per minute. The register of influx has been planned to have 2 feet by $2\frac{1}{2}$ feet of mouth = 5 square feet of surface, and the stream of emerging air within 1 foot of such a register, although one-third its surface may be obstructed by bars or screen-work, may be taken to have the same sectional area. Whence the velocity of the incoming air 1 foot in front of the register may be assumed to be 300 feet per minute, equal to 5 feet per second.

Suppose the entering air to spread out to 3 inches thick upon the ceiling, and to traverse the same for its whole width of 27 feet. The cross section of this sheet of air, normal to the direction of flow, becomes $6\frac{3}{4}$ square feet, giving a velocity of flow of 3.7 feet per second. But it can be relied upon that six or eight times this thickness of sheet of flowing air on the ceiling would be involved in the general movement, and also that the rate of traverse in different parts of the ceiling would be variable, as the current may have been directed from the stream from the register, or may have been induced by the action of the walls or windows in demanding greater or less supply for the downward currents against or near them, and the consequent velocity of the augmented current will become much less than the 3.7 feet per second.

The figures, therefore, which give a maximum velocity (after the

stream from the register is once dispersed) at 3.7 feet per second, only serve to demonstrate that if the *general circulation be established* and maintained, and if it be not disturbed, the velocity of current of warm air within the room will be imperceptible. Currents of air are perceptible, in some measure, as their temperature and their dew-point is less. At 70°, with our usual dry air of winter, 2 feet per second will not be felt, nor will it produce injurious effects.

The platform is to be 6 feet by 10 feet, with one step about 8 inches high. This gives 16 feet long of front riser surface, but from the location of the platform in the corner of the room, and the probable direction of current on the floor setting towards it, the length of the line normal to the direction becomes 12½ feet, and it can be assumed that the opening of perforated front to the riser (wherein the perforations would equal three-quarters of the surface) would be 6 inches high. These dimensions give 6¼ square feet of normal perforated front, which, 1 foot in advance of the front, will have an air-current with 6¼ square feet of cross-section normal to its direction of flow. The quantities of air going out being the same as those entering, the velocity of efflux on this line becomes 4 feet per second.

But there exists a great difference between an in-flowing and an out-flowing current of air. Each particle of air to which a direction of motion has been given has that direction as positively as a cannon-ball, and it will not swerve from the same without encountering positive resistance. So that a stream entering in will follow its path with much persistence; but any particle of air in a receiver in the state of rest, and under pressure, will pass towards an aperture of discharge in the direction of *least resistance*. Omitting some condition of eddies arising from form of aperture, every particle of air equidistant from a given opening will rush towards that opening with equal force, and the resistance arising from eddies by no means establishes the linear direction which *movement* imparts. It consequently follows that this effluent register, into which the vitiated air is induced to flow, by means of an exhaust-shaft of suitable power, will not only take air from the stratum of 6 or 8 inches, but will suck in air from every direction indifferently, nearly independent from the velocity of flow on the floor. That is, the air along the floor, for 2 feet of depth, may be moving generally at the rate of six inches per second, and yet there may be a current entering the perforations of the risers of the platform at the rate of 5⅓ feet per second, without materially

affecting the absolute velocity of air at any level 18 to 20 inches in front of the risers.

In brief: If it can be accepted that the supply of the proper volume of hot air (or rather of fresh air at the proper temperature) will be established by spontaneous movement at the same time that there will be extracted, through the same agency, a like quantity of vitiated air, it seems very probable that the system of distribution and of equalization of heat proposed will aid in the process, and that any system which does not accept the natural circulating movement would be encountering the resistance of overcoming this movement. It is seen also that the great general movement presents the least resistance with the strongest probabilities to equable heating, and that such movement entails velocities of air currents much below the sense of feeling of persons within the room. Except close to openings of supply or discharge, or close to windows, it is nearly certain that these currents can only be found by floating substances (smoke or illuminated dust) or by filaments of silk.

The employment of large volumes of air upon the distribution of temperature within the room, in lieu of no air at all, as in the case of the stove, or of a small volume of highly heated air, as in the hot-air furnace, is a problem. Unless the heating apparatus of itself establishes a more extensive circulation, the cooling effect of the windows and walls cannot be neutralized, except by the attainment of the same degree of heat in the upper parts and by supposing the same temperature of cold on the floor. Some reliance may be felt, however, that the larger volumes proposed will allow a lower temperature at the ceiling and a much higher one on the floor, while increased auxiliary currents will follow the windows and walls, tempering these downward currents to moderate and endurable coolness before they reach the floor. The extreme cold layer traversing the panes of glass should be intercepted, before it falls or follows the wall to the ground, by a broad and level window-seat that will throw it inwards to mingle with other descending air. A splayed window sill is to be avoided, as it furnishes a surface to a cold streak to reach the floor, over which it will roll with little loss of heat to the annoyance of any person in its path.

It may be thought that, in restricting these observations so completely to the distribution of heat, there has been want of proper consideration of the requirements for ventilation. The truth is, that the property of diffusion of gases renders it possible to accept, that any arrangement of warming and ventilating apparatus which shall

uniformly distribute the heat of the air will have completely equalized its chemical properties. If within any given school-room there is supplied a proper quantity of air, and if the room be made comfortable at all seasons with that supply, it may be taken for granted that the ventilation is *perfect.*

The method of ventilating and warming by means of currents involving the *general* circulation of air induced by the cooling action of windows and walls is thought by the writer, as an arrangement of low-temperature heating apparatus applied to school-rooms, to be novel. The most suggestive example of some prominence, approaching to this proposal, may be that of the McLean Asylum for the Insane, at Somerville, near Boston, where there was constructed a hot-water apparatus supplying to the building definite volumes of moderately-heated air through ducts and flues, and there were provided foul-air flues leading to the basement, with passages to an eduction shaft, which was heated, at all seasons, to induce a draft. The distribution of air in this case was made by its entry from openings in the side walls next the ceiling into a general corridor. From this corridor the fresh air flowed by louvres over doors to chambers on both sides of the corridor into those chambers, where it circulated by descending along the cool windows and walls to the floor. Within those chambers a general circulation was presumed to exist. The vitiated air was extracted by openings at the foot of the wall, on the inside of the chambers. The same wall separating the chambers from the corridors carried both order of flues. This apparatus was highly commended after trial in 1848,* and has continued in use until this day. The provision of the heated eduction-shaft obtaining its heat from the smoke-stack of the apparatus in cold weather, and by means of an independent fire at other times, with adequate proportions of ventilating flues and passages, so that they would not overpower one another or the shaft itself, was very well designed.

More recently, in 1873, Prof. G. R. Barker, of Germantown, Pa., patented a double register, to be used in an arrangement where a flue passing from the cellar to above the roof of the house was made to serve both as hot-air and as exhaust flue. Suppose a brick flue, say 12 inches square, to have been formed in a wall from the cellar to the roof, and to terminate in an open chimney; let there be an outlet from the flue to take two registers, one above the other, this outlet to be near the floor of a room; close off the main flue below the floor by a horizontal plate or diaphragm,

* See Bell on Ventilation, Boston, 1848.

which itself has a central opening with a pipe, say 9 inches diameter, from which an elbow is jointed to the upper register. There will now be a connection between the furnace placed in the cellar at the foot of the flue and the uppermost of these registers, forming a clear passage-way, whose least dimension is 9 inches diameter, for the flow of hot air into the room. And, at the same time, there will exist a passage for foul air through the lower register, passing the 9-inch pipe and its elbow and up the flue. A part of Prof. Barker's scheme was to place a small "*jet*" pipe on the elbow leading upward, so as to use hot air from the furnace (under control of a valve), to improve occasionally the draft of the foul-air flue.* The complete closing of the hot-air register can open this jet at all times, and thus relieve the hot-air furnace of its intensity of accumulated heat when no heat is required in the rooms. The plates which close the registers turn on horizontal axes, and give direction to the hot air upwards and outwards, and receive the vitiated air from downwards and inwards. This contrivance, which has the hot-air register absolutely contiguous to the cold-air register—one above the other—has been operated successfully in many cases during the past six years, and no practical difficulty has been encountered from the hot air passing directly to the cold-air register.

There is one point to be made in this question of distribution of heat in a room. So far it has been the purpose to show, by reasoning on general usage, the cooling action of the windows and walls was the sole reliance in all self-acting or automatic heating apparatus. It remains to give the results of experiment in a particular instance, which shall corroborate this reasoning.

In the Prospect St. School-building at Bridgeport, an arrangement of flues and heating apparatus has been provided in some of the rooms, similar in most regards to what is proposed for the new High-School House, and this arrangement has been tested in service during the past year with much satisfaction. Notwithstanding the unsuitableness of the season for exhibition of *heating* effects, an experiment was instituted on the 12th of July, 1880, in the presence of several members of the Board of Education and the writer, who carefully noted the conditions and results. This experiment was intended to show the completeness of the distribution

* In practice, Prof. Barker prefers to omit this jet pipe, as in the hands of janitors or servants it is apt to be misused. Over 500 of these double registers are now in use in public and private buildings around Philadelphia; 50 or more of which are in school-houses.

of heat and the establishment of a general circulation, by the aid of inflowing and outlet flues, both of which were placed in the rear wall of a room (the middle wall of the building). The day was a very warm one, following several hot days, and the hour 5 h. 10 m. to 6 h. P. M., and a clouded sky brought the external temperature to coincide nearly to the probable average temperature of the twenty-four hours and very close to the probable temperature of the walls of the building. The glass windows, which were closed to make the experiment, had of course the temperature of the external air. The temperature of the external air was 78°, and the same temperature existed (with an allowance of 2° to 3° in discrepancies of thermometers) at seventeen points in the room, previous to admission of hot currents.

The room itself was in the third story, 54½ feet long by 20½ feet wide, with a bay or alcove 19½ feet long by 8 feet projection on the front side. The height of the room was 14 feet. The ends and rear wall are partitions; the front wall has a southeast exposure, with two large windows in the main room and three smaller ones in the projection. The rear wall carries the flues. Two inlet flues, each 12″ by 19″ in section, open into the room about 8 feet from each end, at the height of about 7 feet from the floor. Two outlet flues, 8″ by 45″, take out from the room, about 3 feet from each end and close down to the floor.

Twelve thermometers were placed on the walls around the room and in the alcove, and one other placed in the middle of the room; all of these were placed at the height of 6 feet. Four others were placed at the inlet and outlet flues.

The experiment was commenced at 5 h. 10 m., the hot air beginning to flow in both inlet flues instantly, and coming out at 130°. The efflux followed with instant celerity. All the thermometers indicated, practically, the same temperature of 78°. Whatever difference of temperature any one of them indicated, the same difference was maintained in all previous observations, and was attributable to differences in the graduations and not in temperatures, except that there was an elevation of one or two degrees above the average in two cases at the wall opposite the influent registers. At 5 h. 20 m. the influent air had risen to 160°, and the effluent air reached 81°, while the general temperature, 6 feet from the floor, had become 84°, with two or three local changes, at points distant from the hot-air registers, and also in the middle of the room, where 84° to 86° was indicated. At 5 h. 30 m. the influent

air was 145°, the effluent 84°, the general temperature 90° to 92°, 6 feet from floor, with the same small differences in particular localities. (All the heat was shut off that was possible at 5 h. 30 m., but no material reduction of temperature of inflowing air was effected at 6 h.) At 6 h. the influent air was still at 145° and the effluent at 84°; with the general temperature, 6 feet from the floor, at 92° to 94.

At 5 h. 20 m. a pan of lighted rosin was held before one of the influent registers, and the smoke therefrom was allowed to diffuse with the current of air throughout the upper part of the room. This experiment was scarcely as satisfactory in indicating the direction of the inflowing current as it would have been if unaccompanied with heat of burning itself. [Fine foundry-dust will make a dense cloud, with very slight propensity to settle in the air.] Yet the indications were positive as to the rising of the current to the ceiling, and before 5 h. 30 m. the entire upper part of the roem had become laden with smoke slowly descending, generally, but with somewhat greater descent near the walls, and especially the outer walls and windows, towards which the inflowing air was impelling the same across the ceiling at a rate of motion just perceptible to the eye.

The annoyance of smoke became great throughout the room at 5 h. 30 m., and the room was deserted until 6 h., when it was found to be nearly free at least so free from smoke that the room, except from its great heat, was endurable. There was no means at hand to measure the quantity of air introduced and removed; with the size of flues it is not probable that in mild weather it is so ample as might be wished, but the provision, such as it is, is much greater than in ordinary school-rooms. The only convincing demonstration from this experiment was the action of the cool wall in promoting equable distribution without violent currents, and the independent action of the influent and effluent flues, the one giving its current and the other receiving its supply from the air of the room, without the slightest direction of current from the one to the other.

Summing up the whole of the argument upon distribution of air in a room, it may safely be concluded that within certain limits of dimension and form of room, such as will give proportionate force to the two orders of currents, namely, that coming from the force of influx and the suction of efflux, and that coming from the descent of cooled air along the cooler side walls and windows, the

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method of introduction of fresh and eduction of vitiated air, set forth in the plans, should be approved. And, as an opinion on the particular application of the method, the writer believes the school-rooms of the proposed Bridgeport High School are well proportioned for the desired result.

§ At the same time it must be fully recognized that no school-room, or room occupied by a number of persons similarly to a school-room, has yet been successfully warmed and ventilated to the extent proposed by the means of any spontaneous ventilating apparatus. While the distribution of heat within the room becomes one of the essential requirements of an apparatus, and one that has frequently, not to say generally, failed, there exist other conditions, all of which must be met adequately before success is attained.

Primary of these, in connection with the distribution, is the supply and discharge of the air; there must be a motive force to effect both of these separately, and each room must be independent of all other rooms in these regards. A long argument would be needful to establish these statements fully. Brief consideration and assertion will be substituted instead. Each room, by itself and of itself, must, together with its inlet and outlet flues, be considered as one shaft or chimney. Such shaft, starting as a flue from an air-chamber at the ground level, and having a small or limited sectional area, rising some height to an enlargement—the room itself—the sectional area of the room being so out of proportion to that of the flue that the velocity of flow through it or the eddies occasioned by the flow may be imperceptible—and thence again to another flue of limited section rising to and above the roof. Now there are two ways for this chimney to draw: the first of them is by means of heated air supplied at the bottom; the second is by heating the out-going flue above the room, or, in case of many flues, gathering them all to one shaft (corresponding to the supposed air-chamber at the ground) where heat is applied. *To effect abundant spontaneous ventilation it is necessary that both of these ways should be combined in the same apparatus, and it is nearly indispensable that each of them should be perfect in itself.*

In the coldest or in moderately cold weather, below 40°, possibly, the ascensive power of the heated air at the furnace, combined with the ascensive power of air in the room at 70°, if the flues are large enough so that the velocity of current in them is not great, may induce the system to operate. But it is by the intensity of

heat in the air going to the room that it obtains velocity, and the supposition of ample ventilation is one of low heated currents in the coldest weather. A computation of the effects of cooling of the walls and windows of one of the proposed school-rooms appears to demonstrate that the entering air, amounting to 1,000 cubic feet per minute (20 cubic feet for fifty pupils), cannot easily be higher than 90° to 100° when the external air is at zero. It is all that can be reckoned upon to accept this quantity as passing the register of ingress, if no additional impulse were afforded by the outgoing flue. This being the most favorable condition with a supposed diffusion of 70° between the external and internal temperature, how must it be when this difference becomes less and finally disappears?

Taking the lower room of all, there may be a height above the mean height of the heating surface to the inlet-register of 10 or 12 feet, with a difference of temperature of 100° to 70°; and taking the height from the outlet-register to the top of the stack, 50 to 55 feet, with a difference of temperature of 70° to zero, the relative value of the two flues in producing a draft becomes apparent. Even in the uppermost rooms, where there will be a height of hot-air flue of 25 feet, with the difference of 100° to 70° to compare with the height of vitiated-air flue of 22 to 27 feet with the difference of 70° to zero, there is yet an enormous preponderance of value for the suction flues. This is the comparison of value of hot-air and ventilation flues in the coldest weather, and with *closed windows*. As the weather becomes warmer, the heat imparted to the air, at some external temperature not far from 55° to 60°, no heat whatever is demanded—not for the English reason that 55° to 60° is a comfortable living temperature in our American climate, with air of 60 per cent. hydration, but because the heat of the pupils will bring up the heat of the room to 70° readily. It now comes to pass that the motive power for operating the systems of ventiltion *must all be found in or beyond the eduction flues.* *
Dr. Luther V. Bell, who designed and described the McLean

* This method of argument is not very convincing. In truth, in the system of two flues combined, with one room as an enlargement, the whole considered as one shaft, is the proper one. If the height of the hot-air flue be taken at 12 feet (at 100°), the descent in the room at 8 feet (at 85°), and the height of the uptake flue at 55 feet (at 70°), the height of the column becomes 59 feet (at zero), there then would be needed 69.4 feet of air at 70° to balance the 59 feet at zero, or 70 feet at 100°. The velocity of passage of air in either flue would differ inconsiderably, and the sectional area of the flue can be the same. There is a temperature when the *quantity* of air moved by rarefraction of the column *decreases* as the heat increases.

Asylum, asserts that the window openings must not be considered in any plan for systematic ventilation. "Experience has ever demonstrated that buildings in which open windows are relied upon are never ventilated at all." It cannot be allowed that this dictum applies, except perhaps to a hospital. Out of prison, human nature will assert itself, and will open windows on the south side every mild day, and all around on every warm one. A little higher temperature, and windows are open altogether. For a large part of every year the success of the ventilating apparatus must depend entirely, or in great part, upon the operation of the eduction flues. They alone can bridge over the time between active heating and fully-opened windows.

It is not necessary to argue that the heating flues should be independent, that is, separate for each room, or for each register in each room. Hot-air furnace practice has determined this beyond question. It is a feat to balance anything in unstable equilibrium. It is possible to get two currents to come from one flue, each with its particular desired velocity; provisions for regulation may meet all supposable disturbances of original adjustment, but it is better to avoid all need for adjustment, and all after-control, by making two flues. The analogy between the heating flues and the eduction flues is complete. After reasoning out the relative importance of the eduction flues, as has been done, the disastrous result of disturbance of the function of one eduction opening, by derangement of supply or delivery of another, can be appreciated.

The writer wishes to express the decided view that to ensure the successful working of the low-temperature heating and ventilating apparatus proposed, both orders of flues—those for fresh or for vitiated air alike—should be independent flues, each room or each register mouth by itself; so that any pair of flues, together with the room to and from which they pass, should form a perfect shaft commencing and terminating, in all cases, at the same level.

As regards the sectional areas of such flues, were not the case of open windows at times to be considered, it would answer that they all should be the same throughout (proportionate to the space to be heated), but, taking this contingency into account, *each* flue can have a sectional area due to its height. It is not deemed necessary that the effluent flues should be anywhere proportionally larger than the influent ones. although it might seem advantageous to take out by the effluent flues some of the air admitted at windows or doors, or leaking in at the same, yet the disturbance of

the draft of the effluent shaft is a more serious evil than the possible gain in the removal of the excess of air from the room. To meet the condition of an out-of-doors heat of 62° if moist, or 70° if dry, or higher temperature, it is proper to make an opening for discharge of foul air into the effluent passages from the upper part of each room, near the ceiling. Such an opening should be closed by a valve tighter than those usually provided for hot-air registers.

The air supply for such an apparatus should be taken from two if not four sides of the building, with an open passage through or across the basement to avoid effect of wind on the supply, and should be led into one common chamber, from which, as a receptacle, the fresh, cold air should be taken. The vitiated-air flues should be led upwards to one common level (or they may be led downwards to a common level), where, at not less than 6 or 8 feet above the highest register, they can all be joined, preferably, into one common shaft, but certainly with advantage into not more than two shafts. The juncture of these flues should be easy in direction, so that the current in each shall tend to promote that in the other. The common shaft should be heated, to induce the needful draft. The main smokestack can pass up one side of it, and where it passes along the shaft be of cast-iron, to give out heat. The air-shaft should be reduced in size at the top, commencing some 6 to 10 feet down, say, to three-quarters the area of the air flues. According to an erroneous hypothesis, it has been thought desirable to increase the size of a chimney or shaft to allow the smoke or air to escape at a lessened velocity, but it is found in all practice that a reduction is needed to give the escaping smoke or air the suitable direction to resist horizontal winds. Draft shafts or chimneys are improved by conical or pyramidal surfaces to the coping around the top.

§ Having thus fully discussed the questions of the introduction and distribution of air, there remains yet something to be said about the methods producing and controlling its heat. The proposition under discussion involves large volumes of air heated in the coldest weather to comparatively (to usual heating apparatuses) low temperature, and scaling downwards, as the weather becomes mild, to no heat at all. Observation has determined positively, within the last twenty or thirty years, that in occupied rooms there is demanded, to preserve a relative freshness of air, 30 cubic feet of fresh air each minute per person, and that children as a rule,

demand much the same volume of air as adults. It has become usual, consequently, for those who plan a building—dwelling, hospital, jail, school, audience-hall—to accept this doctrine, and aim at providing the apparatus to accomplish this requirement. Notwithstanding the professional or mechanical skill, or through want of one or the other, or of both, the repeated essays have not met with favorable results. No example can now be pointed out where a complete, unquestionable success has been attained. Some of the more extended apparatus for hospitals, jails, and legislative halls have, by the aid of mechanical or forced supply of air, been measurably successful. On a smaller scale, where self-acting currents, aided by chimneys of "appel" or suction shafts, have been applied, the degree of success attained has been generally less positive. While with apparatus dependent entirely on self acting currents, the whole system resolves itself into hot-air supply at high temperature, with control, in moderate weather, through admission of air at windows, to temper the heat, if the quantity of air shall have been maintained.

The difficulties of heating to desired low temperatures these large volumes of air are secondary only to those accompanying the distribution and introduction. What means or appliances, and what control, is demanded to accomplish the result? The surfaces of any hot-air furnace in use in the United States, when giving out their maximum heat capacity, are available to produce currents of from 250° to 400°. With much arrangement for mixture with other air, the temperature of hot-air furnace currents can be brought down to 150° or 200°. Below these temperatures, hot-air furnaces may be said to be inoperative, except by admitting cold air over the fire, with consequent great loss of heating effect of the fuel.

Steam-heating is limited to the production of currents from 80° to 120° above the normal air. The temperatures of surfaces of steam-heated pipes runs from 212° to 230° (for low-pressure steam, such as meets favor for heating apparatus), and these temperatures are, practically, uncontrollable whenever steam is admitted to any coil or radiator.* Attempts to control the heat of steam surfaces

* There are in use two forms of apparatus which allow lower temperatures to the steam-heated surfaces: 1st, that of Jas. O. Morse, of New York, who constructs a house-warming *vacuum* steam apparatus to run below atmospheric pressure, and to produce surface from 160° to 230°; and 2d, that of Loftus Perkins, of London, who constructs a steam apparatus of small hermetically-sealed pipes, affording surfaces of from 80° upwards to 600°, if requisite.

by throttling the steam supply are very unsatisfactory. Coils give out heat determinately until the last moment before being shut off. They fill with water, they freeze up. After the nicest adjustment, if they do not yet give out too much heat, they will, with the increase of pressure in the boiler incident upon their being shut off in part, be found, in a few moments, as active as ever.

It is obvious that the only relief from these difficulties in steam-heating is to be found in some arrangement of heating surface which shall control either the extent of surface under full steam pressure, to suit the variable requirements, or which must divert the whole, or a part, as occasion requires, of the air being supplied, from contact with the heated surface, and thus "temper down" the heat of the stream passing to the rooms. These mechanical devices can be readily arranged. The main points are to have it fully appreciated that they are necessary, and that they shall be at all times judiciously manipulated.

§ Whatever success may be reached in the combination so desirable to make of ventilation and warming, the question of prime cost or of economy in working must not be overlooked. If fully studied and planned originally, the cost of ventilating ducts or flues does not form an unreasonable addition to the cost of the building in which they are placed, and in so far as this cost goes toward the fulfilment of the vital purpose of a school-house, a reasonable expense of 3 to 5 per centum of the value of the house may be incurred without risk from the charge of extravagance, and such an expenditure will meet the approval of all sensible taxpayers or voters. It has come to be generally admitted, for the cost of a steam or hot-water apparatus, regardless of the more pleasant and healthful heat they are capable of producing, that for all extensive uses they involve less expenditure in a few years, say, eight or ten, than the best devised hot-air furnace. If the committee restrict their specifications to appliances of established merit which have the warrant of being merchantable as general commodities, they can rest assured that their apparatus will be immediately serviceable and of great durability. Not that there may not be improvements in boilers or coils or radiators of recent date of much value, but that the experimental development of inventions which are any way dispensable cannot safely be made by any public body intrusted with construction.

The question of economy of working demands in this particular

case of the Bridgeport School-house some thought. The expenditure for fuel and also for attendance of a well-devised steam or hot-water apparatus of a certain size, is less than that of any hot-air furnace system, although the heating effects may be produced by much larger quantities of heat within the rooms warmed thereby. This economy of fuel arises from two causes. The first of these, and principal one, is the superior efficiency of a steam or hot-water boiler in taking up the heat of combustion—that is, the heat of the smoke escaping from the *boiler* is less on the average than that from the *furnace*. The hot-water boiler is especially economical in this regard. The second cause is the comparatively small loss of heat by open windows or doors for regulation, where the heating is done by steam or hot-water heated currents, to that which occurs with the fervid heat emitted from hot-air furnaces.

Ventilation, however, and ample ventilation, is not attained except at the cost of fuel. A comparison between the process of heating by hot-air currents and by ventilating currents can readily be made. A certain volume of hot air suffices to be the vehicle for transporting the heat from the fuel to a room; this air is heated to such degree that it will impart the desired temperature in the process, its available heat for this purpose being what the air is heated above the average temperature of the room; and there must have been expelled from the room just as much air at the average temperature to allow the heated air to come in. The actual loss of heat by using this air as the vehicle of transmission, is what was expended in heating the air originally from whatever external temperature it was first taken into the apparatus, to the temperature of the room, at which it is wasted into the external air again. This proposition is true alike for highly-heated currents with small volumes, or for ventilating currents with large volumes. The quantity of heat to be imparted in the room to cooling walls or windows is practically constant, the quantity of heat *lost* by the apparatus varies with the volume of air passing it, which volume is to be taken as having been heated from the external temperature to that of room.

A certain school-room, when the outside thermometer stands at zero, may be kept at the temperature of 70° by introducing 150 cubic feet of air heated to 250° each minute. There is thus dispersed in heating 180° temperature that has been abstracted or taken away from 150 cubic feet each minute, or 27,000° cubic feet. If we suppose in place of 150 cubic feet there is given for ventila-

tion 1,000 cubic feet each minute (50 scholars and 20 cubic feet each minute), it then happens that only 27° excess of temperature is demanded, and the heat of the influent air becomes 97° in place of 250°. But there is wasted each minute, in the one case, 150 cubic feet of air at 70°, which has been heated up from zero, = 10,500° cubic feet, and in the other, 1000 cubic feet at 70° = 70,-000° cubic feet, or $6\frac{2}{3}$ times as much heat in case of ventilating as in the case of simple heating. Again, the ratio of dispersed heat to waste of heat, with the hot currents, was 1 to 0.4 nearly, while the same ratio with ventilating currents was 1 to 2.6 nearly. And this condition is even worse when heating in milder weather. Suppose the outside temperature to be 40° and the room to be kept at 70°, and suppose the same 150 cubic feet of air to be heated to 140°, here there is dispersed 70° of heat or 10,500° cubic feet each minute. Let it be supposed that in place of the 150 cubic feet, there is given for ventilation 1500 (50 × 30), it then becomes requisite, to provide for the heat to be dispersed, that only 7° should be added to the heat of the entering air above the heat of room, and 77° is all that is needed for the temperature of this mild air current. [All considerations of heat of pupils have been omitted in this rough exhibit.] But there is wasted in the one case 150 cubic feet of air at 70° heated from 40, = 30° × 150 = 4500° cubic feet, and in the other 1500 cubic feet × 30° = 45,000° feet, or ten times as much. The ratio of dispersed heat to the waste of heat with hot currents in this last case was 1 to 33, while the same ratio with ventilating currents was 1 to 4.3.

The total quantity of heat to be imparted to air for this single room in coldest weather (following the above suppositions) is for hot-air currents 37,500° cubic feet, for ventilating currents 97,000; and for mild weather, with hot-air currents 15,000° cubic feet, or with ventilating currents 58,500. The relative dimensions of boiler and of heating or so-called radiating surfaces for the two apparatuses, *and, in cold weather, the consumption of fuel*, are determined by the 37,500 to 97,000 values.*

Although these figures have been made on supposed bases, and

* The above assumptions are comparisons of hot-air furnace currents with steam or hot-water heated currents. If we take steam-heated *hot currents*, about 160° is the highest supposable temperature, when there will be demanded 300 cubic feet of air to carry the needful excess of temperature to the room, and the ratio of the two supposed high and low temperature apparatuses, in their respective boiler and heating surfaces, and in fuel consumed, becomes 48,000 to 97,000. In warmer weather, the ratio of fuel consumption becomes yet more unfavorable for the low temperature apparatus.

are only approximations towards the real facts of dispersed or loss of heat in or from the room, yet they are perfectly reliable indications of the results of hot-air current warming compared to ventilating current warming, and the proportions established have been borne out in numerous cases. It is evident that ventilation is not economic as a process of warming. The writer has examined many buildings where, after a demonstration of successful ventilation, the working of the apparatus has been permitted to degrade to the barest warming. This has been particularly the case in hospitals where forced ventilation has been provided by a fan driven by its own independent engine. In such cases it may be said to be a not unusual result that the fan gradually falls off in speed and finally ceases to run, until after some lapse of time, some new broom is instituted to revive the ventilation. In one of our largest eastern cities the economic result of stopping the fan in a general hospital was made the matter of boast by the administration, and finally led to its removal and the substitution of a self-acting system, which latter—alas for the economy!—proved equally costly to operate and scarcely so effective to regulate, as was the older plan.

But in the case of a school-room, the occupancy of the building is restricted to less than one third the time on week-days, and including Sundays, to but about one-fourth the whole time; so that by judicious attention from the directors of the school the great expenditure of ample ventilation, in fuel and heat, can be materially cut down by disuse of ventilation except at essential times. To effect this purpose the great air supply for the whole building should be regulated to meet the condition of occupied or unoccupied. And it is to be recommended that the effluent shafts be dampered (in the usual way that chimneys of factories are regulated) to reduce the pressure of cold air upon the building when the air-supply is mainly or partly closed off.

Careful and judicious management of such an apparatus as is proposed is requisite at all times and seasons, not only with a view to economy in the use of fuel, but also to render efficient the primary object of thorough ventilation. It has been accepted that if 30 cubic feet of fresh air each minute be supplied for each scholar when the schools are in session, the requirements of healthful ventilation will have been met. This volume, however, has been established rather by reiteration of writers on the subject of ventilation than by any sound argument. It has all the authority

of an average of suppositions, being merely what is guessed to be sufficient to render the vitiations from one person to become endurable. The real quantity of air impaired by any one individual in a state of comparative rest each minute is absurdly small compared with this volume. Only about one-third of a cubic foot of air is vitiated by breathing (inhaled and exhaled) in one minute's time, and even this is not entirely spent for use over again. There is a quantity of air vitiated by transpiration from the person. Probably a breathing action goes on in some manner from all parts of the skin; an absorption of oxygen and exclusion of carbonic acid, moisture, and organic vapor or organic particles, similar to that occurring from the lungs, and there is certainly a transpiration of moisture laden with organic matter, in considerable but very variable amounts. On the whole it seems safe to say that the ventilation would be absolutely perfect if there could be removed, without admixture of other air, the volume of air exhaled in breathing, together with a layer of air next the person, and the two volumes were taken to be one cubic foot of air per person; while at the same time there should be furnished the same quantity, to answer the double purpose of supplying fresh air for inhalation and a new "atmosphere" next the person. For the purpose of supplying a desired or desirable *mixture* of fresh and vitiated air we use 30 cubic feet of the former, where the *requisite* is the *substitution* of a single cubic foot of fresh air for a single cubic foot of foul air!

The same course of argument applies to a room full of vitiated air with equal force that it does to a single individual whose vitiation is to be removed. One single displacement of the entire volume of air in any room, to take place after each session, is more efficient in the removal of vitiated air than an hour's "systematic" ventilation of the most approved kind. Our ventilating quantities of air and elaboration of sizes of ducts and flues, our discussions as to force of impulse for affecting the supply or inducing the escape of air, all pass for little, compared with the volume and dimensions of the current or the motive force proceeding from a pair of open windows, with a fresh northwest wind. The distribution of current in the room need not be investigated; an instant's sweep will freshen the whole room. The expenditure of fuel in reheating the room in the coldest weather after such a respiration is far less than would be demanded to obtain the same degree of purity through intermixture of currents from the apparatus.

Without the aid of the wind, and at times and seasons when activity of the circulation in and out of the supposed open windows would be least, the freshening of the air of an opened school-room by diffusion alone would surpass the ventilating effects to be produced at any reasonable cost in fuel by the best designed or most judiciously manipulated apparatus. It is scarcely possible to attach too great importance to this method of evacuation of vitiated air, as a part of the system of operation of the proposed apparatus, beside its great advantage in the economy of working, as in this way the supply of air in large volumes can be suspended for the most of fourteen or fifteen hours between the sessions on any two following days, and from thirty-eight to thirty-nine hours from Saturday to Monday.

§ The writer believes he has now pretty nearly followed the main questions, which a study of the plans and methods proposed for warming and ventilating this school-house have presented to his mind. Two incidental points, however, offer themselves, about which it seems to him proper to remark.

The first point relates to the arrangement and ventilation of the clothing-rooms. They should be of ample size, well lighted, airy, well warmed, and above all, well ventilated, and they should have impermeable side walls and perhaps ceilings. Not at all unfrequently the school clothing-rooms have none of these requisites. The requisite of dimension is that which will give independent hanging room and places for each of the garments of the fifty scholars supposed for each school-room. Contact of garments may be tolerated, but not packing, and it would be better to avoid contact. Light is the sole reliance for order and cleanliness. Air or ventilation should remove all personal odors and carry away any evaporation from damp clothing, and for ventilation it may be suggested that 4 or 5 cubic feet of air per scholar per minute will not prove excessive. The impermeable painted walls are needed to prevent the gradual accumulation of organic matter that will have been transported into porous plastering by evaporation from clothing, which organic matter becomes offensive, and in time creates a pervading and unhealthy odor.*

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*One of the incident troubles of the system of moderately-warmed rooms is found in the incapability to impart heat to any person coming cold into a room with desirable promptness. The difficulty is especially attached to children having cold or damp feet. It has been suggested to provide in the hall, for use in cold or wet weather, areas of heated flooring, and such a provision seems to be worthy of consideration by the building

The second point is the closets. Like the clothing-rooms, these should be of ample size, well lighted, airy, well warmed, and above all, well ventilated. For the ventilation, the propriety of removal of all the air at or near the seats is almost too obvious to need mention. The place of admission of air is more difficult to stipulate, but if possible it ought to be entirely by means of the doorway from the corridor, or hall, while the heat may be then applied by direct radiation. The danger of having hot air flues entering a closet is that the hot-air flues may overpower the ventilating flues and an outward current of air may be established from the closet into the building. There is one more requisite: they should be well, not to say highly, finished. It is urged upon the Committee that care be taken and expense incurred to make these rooms show-rooms, in light, in finish, and in general nicety. It is not extravagance to specify and expand reasonably upon what is so conducive to the moral as well as physical welfare of the children, and it would be a trifling addition to the gross cost of the proposed structure to provide for these rooms tile floors, white marble division plates, enameled brick walls, and generally to fit these rooms up with substantial elegance.

§ In finally concluding this report it becomes necessary to say that it is not the mere question of the system of distribution of the air currents which was the occasion of this discussion, upon which the success or failure of the ventilating and warming of this school-house will depend. No one cause has been the general reason for failing to attain a standard of accomplishment; for instance, a supply of 30 cubic feet of air per scholar per minute in school-rooms. The inlet flues, the outlet flues; the air-chambers and ducts; the air-shafts and wind cowls; the means of control and the control itself; the kind of heating apparatus; and, if steam or hot-water, the boilers and radiating surfaces; all of these, any one of which may be deficient, must be, if not perfect, at least practically operative, to secure the success of the apparatus.

No attempt has been made in this paper to set forth or to dis-

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committee and architect. If the heating apparatus be a hot-water one (and a subsidiary hot-water circulation can be formed below the level of the water with steam-boiler), the regulation of temperature of an iron slab to degrees of heat which will not injure wet leather or india-rubber becomes, by means of a transfer circulation, very easy. With a steam apparatus a flat coil of steam-pipe laid in a sand-box covered by an iron plate, or preferably a similar coil of steam-pipe upon which is laid a very heavy iron plate 2½ to 3 inches thick, will form a piece of standing floor of the requisite temperature.

cuss dimensions or proportions of apparatus or adjuncts, or to specify either mechanical or architectural details pertaining to the warming and ventilation. Even the designation of the requirements of performance, and the qualifying conditions of apparatus, with sufficient argument to support assertions, has led to this extended report. With the conclusion of the Committee to accept the plans of a competent architect, and to adopt definite methods for warming and ventilation, they can properly rely upon him for whatever comes within the field of his professional skill.

While it is beyond the scope of inquiry devolved upon the writer to consider either the architectural effect or the adaptability of the plans for educational purposes, he may be allowed to congratulate the Committee upon the promise of successful results in both these regards which the following of them will ensure.

The plan for ventilation and warming, however, presents some noticeable advantages of high value. In the basement, the air passages and chambers can be made to occupy the central or dark portion alone, and can thus be isolated from the rooms completely and altogether. One light room of the cellar should be given to the apparatus as a boiler-room, and possibly one or two others may be used for storage of fuel, but the general basement will become available for the purpose of the school. In the stories above the basement, the positions of the several flues present unusual facilities for grouping them into one or two shafts, whereby the essential control of these flues can be secured. Every constructor or operator of steam or hot-water heating apparatus is aware of the difficulties of extended circulation—difficulties in a great measure avoided by the compact disposition admitted by these plans.

The lesson of improvement of the ventilation of school-houses has greater public importance than the construction of a suitable school-house at Bridgeport. If, after full consideration of the best lights procurable, the Building Committee conclude that, with reasonable economy, they can adopt the methods recommended, they will have their warrant and justification with the community at large, and with the voters of Bridgeport.

SEWERAGE PROBLEMS:

THE

Intercepting Sewer for Hartford.

REPORT OF SPECIAL COMMITTEE,

WITH COMMENTS;

The Sewerage of New London.

BY

C. W. CHAMBERLAIN, M.D.,

SECRETARY OF THE BOARD, MEMBER OF ADVISORY COMMITTEE AM. PUBLIC HEALTH ASSOCIATION, ETC.

WITH

REPORT OF COL. GEO. E. WARING, JR.,

SANITARY ENGINEER.

PLAN OF PARK RIVER
Showing outlets of present Sewers and location of a
PROPOSED INTERCEPTING SEWER
Scale 400 ft to an inch
Chas. L. Burdett, Civil Engr.
1880.
Notes
Present sewers are shown by dotted lines
Proposed sewer is shown by a broken line
Figures show heights above City Base and size of sewers. Figures underlined show heights of sewers above City Base.
PROFILE OF PARK RIVER
Horizontal Scale - 400 ft to an inch
Vertical - - 40 - - -
PARK RIVER
NORTH BRANCH
SOUTH BRANCH
CONNECTICUT RIVER
The New Britain sewage flows in this branch
Outlet for Parkville
FARMINGTON AVE
ASYLUM ST.
PEARL ST.
CAPITOL AVE.
PARK ST.
ELM
Capitol
Park Pond
MAIN ST.
SHELDON ST.
Freshet of 1854
Bed of River
Rock
Hartford Base
Summer level
Laurel St.
Capitol Ave.
Flower St.
Broad St.
Ford St. Bridge
Trumbull St. Bridge
Mulberry St.
Main St.
Front St.
Commerce St.
Conn. Valley R.R.
AM. PHOTO-LITHO. CO. N.Y. (OSBORNE'S PROCESS)

THE SEWERAGE OF HARTFORD.

The sanitary questions involved in the plans for relieving the Park river from sewage pollution are of such general interest that their discussion finds appropriate place here. It is moreover intended to present in these reports as faithful an account as possible of all sanitary improvements in the State, and from time to time illustrate such topographical details as are of interest. The accompanying maps show the valley of the Park river and of some of its tributaries, in its course through the city. The commencement of its water-shed was shown in that part of New Britain included in the map of the area of the Quinnipiac, last year. It is hoped to illustrate its whole course later, in connection with a study of the river basins of the State. The sewerage map of the city also forms a valuable contribution to the sanitary history of the State, and is of permanent value in the study of the development and advance of such work in the State. As the State Board of Health was represented on this special committee by its Secretary, it is all the more appropriate to publish the result of their labors. Our thanks are due to the committee for their consent to use all or such portions of the report as might be of service, and for tracings of the maps, which, with some alterations, are as prepared for them. The data for the construction of the maps was, to a great extent, in the Street Commissioners' Office, and in that of the City Engineer, Mr. C. L. Bunce, and obligations are here acknowledged once for all, for all information thus derived.

The map illustrates the division of the city into drainage districts. Although contour lines are not given, the elevation of the streets and sewers will show sufficiently the natural boundaries these follow—so further discussion of that part is not necessary.

The question under discussion may be briefly stated as follows: There is in the center of the city a rather sluggish stream; generally fed, however, by mountain brooks, which in heavy rains swell its current rapidly to many times its ordinary volume, and

more than double its ordinary velocity. This stream is several times in its course ponded by low dams, the highest not more than six to eight feet. The nature of its bed is shown in the accompanying profile. This stream, in its course, runs through the park, hence its name. During the last few years it has become more and more contaminated by sewage and manufacturing waste. One of its tributaries, Gully Brook, is an elongated cesspool, much more contaminated than the river itself. The sewer to relieve the pollution of Gully Brook is, however, under construction, but only to pour its contents directly into the river, instead of first into a sluggish, obstructed brook. This, however, will be some improvement, as the sewage will not be already half putrified when it reaches Park river. The dams before mentioned are, unless by act of Legislature, not under control of the city, and throughout several months of the year the sewage is ponded behind them, an area for settling all matters held in suspension provided, as well, for evaporation under the hot suns of midsummer. As a natural consequence, decay goes on rapidly; often the bed of the pond along the margins is exposed for a greater to less extent; in dry seasons two-thirds or more of the bed of the pond is uncovered. The effect of such a state of affairs can be easily imagined. When the water is high the evils are comparatively small, but usually in summer and fall the condition is, to say the least, not sanitary. The question then arises, how shall this condition be remedied?

There is at the mouth of the river a deposit of mud and quicksand that has been brought down by the stream when rapid; the depth of this is unknown. At the Valley Railroad bridge piles were driven repeatedly, and finally they were closely wedged together, and then the pier built upon them, so that the bridge is really a floating bridge; the piles upon which it rests do not touch bottom, as I have been informed. This is stated to show the nature of the mouth of the river; the bridge of course is built according to engineering principles, and is as solid and strong as if the piles rested on granite. Now if, as has been proposed, the river were to be used as an open sewer, the city removing or controlling the dams, this bar at the mouth of the river would be of the heavier sewage, and partially uncovered at low tide, would be a reeking nuisance, as bad, if not worse than the present condition of the river; by narrowing the channel and flushing the river occasionally, a ditch would be cut through this deposit merely, but the

mass would remain. Moreover, the bank of the river for a considerable distance would be polluted by a similar deposit.

The intercepting sewer proposed would be open to none of these objections, as its outlet would be carried out into mid-channel, where everything would be carried along swiftly, and long before anything would drift to the banks a more or less complete oxidation would have taken place, or, at worst, the deposit would be far below the city limits. Using the river as a sewer, all that is now ponded behind the dams would be carried to the outlet, and the deposit correspondingly increased, so that at shoal water, if not at other times, a sewage-polluted mass would be exposed to the sun and air, its emanations to be swept over the city, and that too, every day in the year except at high water in the river in the spring. Another objection to using the river as an open sewer is, the blot upon the beauty of the city to allow a vile, polluted stream to flow through its very heart, and continually call the attention of strangers to its noisomeness. Again, the park is the breathing-place, so to speak, for the poor; where the weary mother takes her infant from some crowded tenement-house to secure pure air to aid in its struggle against the disease that has threatened its young life, and in the scorching heats of midsummer from her stifling attic-room, seeks the shade, and the air, cooled by this running stream. If an open sewer, would its emanations be life-giving or beneficial? As the city increases in size, the greater will be the value and necessity of this park for this purpose, and eventually the river will be purified. As before stated, in an æsthetic sense alone, the purity of this stream is demanded, and is one of the inevitable gifts of the future.

The unreliability of reservoirs in securing an unfailing supply of water in a dry season is pretty well known to all the inhabitants of this city, and the mere fact of a series of dams will not secure a certain supply whenever wanted, so that in a very dry season when the sewage evils are at their very worst, upon the open sewer plan, there would be no supply of water to constantly flush this long sewer, and a greater evil will result than the one sought to be remedied.

The following account of the sewerage of the city, and discussion of the plans of relief, is taken from the report of the committee, with such omissions and additions as seemed expedient.*

* Report of the Board of Street Commissioners, Health Committee, and Joint Special Committee of the Court of Common Council on the Park river nuisance. Prepared for the committee by C. L. Burdett, C. E.

The first public sewer in Hartford was built in Ann street, at a cost of $840, in 1844, and between that time and 1855, when the Connecticut river water was introduced into Hartford, thirty-two sewers were constructed.

The system that has been in use in this city, from the date of the first sewer to the present day, is known as the English, or "water-carriage" system; in which the sewage is mixed with a large proportion of water, and carried in pipes or sewers to a convenient outlet.

Before 1855, the wells and springs, and the water distributed from Babcock farm in wooden logs, (some of which have recently been dug up on Main street,) furnished the supply of water for diluting and removing the sewage from dwellings and streets, and since 1855, with but few exceptions, the supply of water has been ample for that purpose.

From data obtained from Superintendent Murphy, of the Hartford Water-Works, it appears that the daily water-supply during June, July, and a part of August, of this year, averaged 130 gallons per head.

It has been said that Hartford has no sewer system, but that seems to be an error, at least in part, as a study of the sewers, as built, shows in each of the sections into which the city has been divided in the effort to dispose of sewage, a trunk, or large sewer, and smaller branches or laterals, radiating from this trunk, and diminishing in size to their origins.

The mistake in applying the system, and the faults of design or workmanship that may exist, are outside of the question under consideration.

The plan has been to conduct the sewage by the readiest way to the nearest brook or natural stream, draining the slope which sought relief. The instances are rare in which a sewer has cut through a ridge to discharge into another basin.

Between Avon street and Arch street, east of Main street, the sewers find a ready outfall by a direct course to the Connecticut river, but in other parts of the city the brooks or the open meadows receive the sewage.

Up to the present time, Hartford has built 39.8 miles of sewers at a cost of $530,000, and the growth of the city in territory and population already demands additional expenditures.

Of the 8,358 acres within the city limits, 5,100 acres are comprised in the Park river basin, and the sewage from this section

flows into the Park river through 29 sewers, of from 18 inches to 10 feet in diameter, twenty of these entering from the north side, and nine from the south. In addition to the New Britain sewage, which empties into the south branch, the discharge from the main sewers in Asylum avenue, Farmington avenue, Laurel, Park, Broad, Hungerford, High, Asylum, Trumbull, and Main streets, and from a large number of private drains, the sewage from 551 acres of occupied land is poured through Gully brook and the culvert to Park river, and in this stream the ponding of the water by the dams has caused the deposit of large quantities of filth, until the river is little better than a large uncovered cess-pool, in which, under the heat of the sun, decomposition and fermentation of sewage are constant conditions.

POLLUTION OF PARK RIVER.

An examination of Park river during August last showed its ordinary condition during the summer months. At the Connecticut river where the water was 7.6 feet deep, the bottom, 5 feet below the city base, was of mud and clay, covered in places with stone and gravel. The piles supporting the Connecticut Valley railroad-bridge were driven about 30 feet without striking rock. Near the Front street bridge, 2,600 feet west of the Connecticut river, a ledge of rocks appears in the river bed, and rapids occur at intervals to the saw-mill dam, where the grade is 5.8 feet at the bottom, and 12.3 feet at the crest of the dam.

This dam sets the water back to a point west of Main street, where the ledge and the rapids again appear, near Daniels' dam, which is 4,240 feet from the Connecticut river, and its crest is at a grade of 21.3 feet.

The water in the saw-mill pond is dark in color, filthy in appearance, and offensive in odor. Sewage, dead fishes, and vermin float about on the surface, and are swept to and fro by the wind.

The shore near Sheldon street is about two feet above the river-bed, for half the width between high banks, and on this shore garbage is thrown down in places in large heaps, and sewage from drains spreads along through a rank growth of weeds, over stones coated with slime.

At 8,000 feet from the Connecticut the ledge appears again near the N. Y., N. H., and Hartford railroad shops, and between Daniels' dam and this point the bottom of the river seems to be very soft, and covered with a deposit that gives off large quantities

of gas when slightly disturbed. The water ponded here has no better appearance than that in the pond below.

At Mulberry street the average depth of water is 3.6 feet; at Trumbull street, 4.3; feet at Ford street is 1.6 feet; and at the Park bridge is 2.4 feet.

From the point near the railroad shops to Sharps' dam, which is 10,500 feet from the Connecticut river, the ledge and rapids appear.

At Capitol avenue bridge the average depth of the water is 3.1 feet, and at Laurel street is 6.6 feet, and the channel depth is 10.4 feet.

The river forks at 13,880 feet ($2\frac{5}{8}$ miles) from the Connecticut river, and from Capitol avenue to this point the water, though dark in color, seems free from odor, and not very foul; but in the north branch, at the outlet of the Laurel street (Nook Farm) sewer, the water is ponded by a bar which forms a natural dam, and there the pollution is apparent and offensive.

From Laurel street the bed of the stream rises 1 foot in 180 to Capitol avenue, and from there falls 1 foot in 480 to the Connecticut river.

The water ponded by the dams accumulates impurities from the constant flow of sewage, and it is purified but little by even a heavy rain, as the current fails to reach and scour out the foul deposits on the sides and bottom of the river.

In the center of the city, in addition to the filth deposited on the banks of the Park river, there is a surface of about $9\frac{1}{2}$ acres (415,000 square feet) of foul water, giving off for many hours of the day the dangerous products of fermenting and decomposing sewage.

When it is considered that this evil is growing, the necessity for a remedy is obvious. For it is taken as granted that the serious injury by this state of things to the health of the people of Hartford is beyond question.

PLANS FOR RELIEF.

HIGH AND LOW LEVEL SYSTEM.

It has been suggested that by dividing the sewers into a high and low level system, by intercepting sewers that would cut through the dividing ridge at Main street, near the tunnel (for the north section), a large portion of the sewage might be diverted from Gully brook, and so from Park river.

But the difficulty of finding a proper location for the crossing, the fact that a large section west of Gully brook can be drained only by a low level sewer near the brook, and the necessity for still providing an outlet for at least 50 per cent. of the whole sewage by the present route to Park river, effectually dispose of the plan, on the score of economy.

The same objection applies to the application of the plan to the section south of Park river.

The remedy seems to lie in taking the outfalls of the sewers as they exist, and applying the correction in or near Park river.

SINGLE AND DOUBLE SYSTEM.

At the sides of most of the Hartford streets that are sewered, catching water-basins or wells are built and connected with the sewers to take the drainage from the streets during rain storms, and the amount thus collected has been in most cases allowed for in determining the size of the sewers.

In the system where all rain-fall is excluded, and the sewers are constructed to carry house-sewage alone, they are comparatively small, and are built at an apparently small expense.

As the Hartford sewers have been built to carry a certain per cent. of rain-fall, any intercepting sewer that may be built should be designed with this fact in view, unless it may be intended to introduce a new system, by commencing with a small trunk, and gradually extending the "double" system, and laying the new branches for the house-sewage, and using sewers now built to carry storm-water only.

This plan would be carried out at a sacrifice of much of the old work, that has cost individuals at least $200,000, in addition to the $530,000 assessed and expended by the city.

(The question of the availability of small sewers has perhaps been demonstrated by their satisfactory use at Memphis. There has been, however, one point demonstrated there that indeed was well known before, that there must be a plentiful water supply to flush them, else they become foul. As it has been impossible to go through any summer yet without recourse to the pumps, this additional tax on the water supply is for the present certainly out of the question, and, indeed, for all time, unless some other source of water supply is sought, for it is not probable that the source now depended upon will be more than met in the increased wants arising from the natural growth of the city. Thus, if there were no sewers at all, the construction of small pipe-sewers might well be reconsidered, but with the deficiencies in the

water supply, and also the fact that in many instances the house-drains are larger than the proposed drains, involving great expense and trouble to change, it appears out of the question to seek relief in this way. Moreover, the forced ventilation of the soil-pipes in every house could not as readily be secured here, as in case of the carrying out of a new work in an unsewered town, however desirable such action may be. Therefore, while fully believing in the separation of storm-water and sewage, and in the superiorityof the small sewer system, the general opinion of the non-feasibility of the change for this city was accepted).

THE REMOVAL OF THE DAMS.

It is claimed that by removing the dams in Park river the water will be maintained clear and innoxious by allowing the river an unobstructed flow to the Connecticut river ; and this might be the result if there were sufficient supply of water at all seasons to insure a large dilution of the sewage.

The slope of the Park river bed from Capitol avenue to the Connecticut river is 1 foot in 480 feet, and to maintain a constant flow of 1 foot in depth for a width of fifty feet, a water supply of about 350 cubic feet per second is necessary.

From measurements at Daniel's dam in 1874, the mean discharge of Park river was found to be 139 cubic feet per second, and the least discharge, 25 cubic feet per second ; which is only enough to maintain a narrow thread of river. And as 4.2 cubic feet of sewage enter the river per second during the dry season, the dilution will not be more than six (6) parts of water to one part of sewage ; while twenty parts of water to one part of sewage, for a slow-flowing stream, is given by Mr. Hawksley as the lowest safe ratio of dilution.

The present river bed is saturated with decaying sewage, and the pernicious effects of the exposure of this matter by what would amount to the abandonment of three-fourths of the present river bed, can best be shown by the evil results in places where similar experiments have been tried.

Even though the supply of water were sufficient for the purpose desired, the cost of the mill privileges that would have to be bought would be a large item in the expense of the plan.

As an argument in favor of this plan of maintaining the river as an open sewer, attention has been called to the fact that one city at least has a nearly stagnant stream of foul water in its midst, that receives the surface drainage and that from a few sewers, and that no ill-health has arisen from this source.

But this is hardly a parallel case, as the city in question (Baltimore) has but few sewers, the faeces and refuse being removed from vaults by hand labor; and the water of Jones' Falls, though impure, cannot approach in filthiness the Park river, Hartford, where the sewage from five-sevenths of the occupied territory, and of at least half of the inhabitants, is ponded in the heart of the city.

PLAN FOR CONSTRUCTING MORE DAMS, AND ALSO NARROWING THE RIVER BY RETAINING WALLS.

This plan involves the cost of constructing the retaining walls, two or more dams with flush-gates, the building of flush-gates, and repairs at present dams, the damages resulting to the water privileges and from flowage.

The distance from Front street to Sharps' dam is 7,900 feet, and if walls were built on both sides of the river, the total length will be 15,800 feet, and the cost close upon $54,000.

The amount of damage done from injury to the mill privileges and from flowage is uncertain, and can probably be ascertained only by decision of arbitrators and the courts; but they will no doubt be large enough to form no minor item in the sum total.

But the points to be examined more carefully are the utility of the plan, and the possibility of carrying it out.

It has been shown that very little water flows in the river during the dry season, and that the amount ponded is at least one-seventh sewage.

At the time when the cleansing is most needed it will be injudicious to draw largely upon the ponds for flushing, as there will be no certainty when they will again be filled, and a large quantity of water will be needed to maintain the velocity required to remove deposits.

By ponding the sewage, deposits are formed, and in this, as in all sewers, the great principle to be carried out is, that the sewers when once cleaned should be kept free from deposits.

"In introducing flushing arrangements in which the sewage itself is to form the motive power for flushing, care must be taken; otherwise it will be found that the damming up of a volume of sewage for a considerable time will lead to the deposit of sedimentary matter, which, when the flushing-gate is open, will accumulate some distance below it; and for this reason it will be well to combine in the system more than one mode of effecting the flushing. Sewers are more readily cleaned with pure water than with sewage."

To make the plan effective a generous supply of fresh water should be made available, and if that were possible no great change need be made in the present arrangement of dams in the river,—it would solve the problem at once.

SEWER IN THE BED OF PARK RIVER.

For 7,900 feet of the 10,500 feet from the Connecticut river to Sharps' dam, the bed of the river is a ledge of rock, and to protect from ice any sewer (either of iron or brick) that may be built in the river bed, it should be sunk in a trench, and bedded in, and covered with cement. The work must be done in a place liable to flooding by heavy rain-storms that may occur at any moment, and that would stop the work, and imperil and destroy that already completed.

The sewer would require an artificial foundation for about 2,600 feet from the Connecticut river west, and its exact cost can be determined only by a thorough examination, by borings, of the character of the soil for this distance.

If the sewer follows the grade of the river bed, the grade of the invert of the outlet will be at about seven and five-tenths feet below the city base.

Above Sharps' dam a suitable location for the sewer can be found on the river bank. Starting, as in the previous plan, from Sharps' dam, a good rock foundation for a wall will be found for eight-tenths of the distance to the Connecticut river, and for the rest of the way an artificial foundation must be built. The wall would be built about ten feet out from the river bank; and back of the wall, and between it and the present bank, the sewer would be placed, and earth filled in over it, and turfed.

Connections with this intercepting sewer and the present sewer mains must be made across the river bed.

LEVEL OF OUTFALLS.

Keeping in mind that the aim of the "water-carriage" system is to secure the prompt removal from dwellings of all refuse before it shall have time to begin any dangerous fermentation, it will be seen that whatever tends to retain the sewage in the pipes, or to delay the discharge, and induce back-water from heavy storms or floods, is to be carefully avoided. Whenever from a deposit in the sewers they are clogged, or their outlets are sealed by flood, there is danger of back-water in cellars from the house drains;

and if a rain-storm occurs at such times, the cellars are sure to receive a deposit of sewage that is set back, and forms a most fertile source of disease and suffering.

"The residents on a line of sewer, having paid their tax for improvements, expect to be benefited by it, and, that they shall not be disappointed in this very natural expectation, the outlet of their sewer should not be sealed by the tide."

"From a mistaken view of the purpose to be secured by a proper system of drainage, the tendency appears to be constantly towards placing the outlets of sewers at a too "low level."

The following tables, computed from Generals Warren and Ellis' report on the Connecticut river, are of value in determining the proper level of the main outfalls of the sewers.

By the list of floods from 1801 to 1874, it appears that of fifty freshets the highest (1854) was 29.83 feet above low water, the mean height was 19.76 feet, and the least 12.25 feet.

The average duration of the highest floods from 1871 to 1877 was 7 days; and in 1873 the water stood for 46 days above 12 feet, and for 48 days above 10 feet.

TABLE NO. 1.

Average of 7 Years.		Height.	Discharge cu. ft. per sec.
Connecticut river stood	318 days,	2 ft.	6,500
	133	4	
	206	6	17,600
	85	8	
	56	10	36,600
	37	12	47,200
	9	16	
	3	20	101,100

CONTINUED FRESHET.

Water at 12 ft. and over.	Year.	At 10 ft. and over.	
31 days	1871	32 days	
28	1872	31	
46	1873	48	
22	1874	26	
18	1875	46	interval of 3 days.
37	1876	63	" 2 "
9	1877	15	
—		—	
Average, 27		37	

These heights are referred to the United States base, which is about 2 feet above the city base, so that 10 of the United States equal 12 of Hartford grade; and it is seen that for an average of 37 days the water stands at and above 12 feet.

By this it would seem that any intercepting sewer that may be built should have the invert of the main outlet at a grade not below 12; and by providing a branch outfall for service during low water, this grade of 12 for the main outfall may be easily maintained.

RAINFALL.

As provision is made for the discharge by the sewers of a portion of the rainfall, a knowledge, of the amount of rain, and of the duration of the storms, is important in determining the size of the sewers in any district.

From a large number of observations, the frequency of rainfalls of one inch per hour has caused it to be adopted, in Europe and this country, as the maximum to be considered in designing sewers.

The still more important ratio of the time of the discharge of the storm waters to the duration of the storm has been taken as 2 to 1. That is, a rain of 1 inch in 1 hour will take 2 hours for discharge through outlets.

This ratio depends so largely upon local considerations that it is deemed of sufficient importance, as an element in the present case, and as of value in future estimates for drainage of any part of the city, to prepare the table in Appendix B, mainly from observations made by Prof. John Brocklesby, of Trinity college.

INTERCEPTING SEWER.

On the map accompanying this report is shown a plan of the Park river and vicinity, a profile of the river bed, the outlets of the sewers which empty into the river, and also the line of an intercepting sewer which is located in a position which, after a careful study of the ground and the requirements of the case, appears entirely feasible. The proposed sewer begins at the Park street sewer, at a point about 200 feet west of the river, and, running northeasterly along the left bank of the south branch, crosses the north branch at the curve in Riverside street, and joins the extension of Laurel street (Nook farm) sewer; thence easterly along Riverside street and extension to a point near the left bank of Park river, where it curves to the north, following the bank

near the water past the ice-houses, intercepting the Capitol avenue sewer, and just above Sharps' dam turning south across Park river, and following the right bank back of a retaining-wall for about 400 feet, at Weed's factory, intercepting the Lawrence, Flower, Broad, and Hungerford street sewers, and at the Park passing back of the retaining-wall for about 800 feet to a point near the site of the old Imlay Mill ; thence continuing along the Park bank to a point west of and near the stepping-stones, where it crosses Park river, and joins the Gully brook main.

The sewer thus far is about 8,500 feet in length, and for about three-eighths of this distance it is on private land, but in such a location as to damage the property but slightly.

From Park river to Riverside street the land where the sewer passes (between the high bank and the river) is valuable only for pasture, and from Woodbine street to Capitol avenue the sewer follows close to the water, about 200 feet back of the houses, where the grade of the river is about 8 feet above ordinary water-mark in the river, and affords ample cover for the same.

The land east of Sigourney street and south of the railroad tracks, to Sharps' dam, and from Flower street to the Park, is unoccupied, and at the Weed factory, except for about 400 feet where the sewer could be built back of a retaining-wall, no difficulty will be experienced in securing a suitable line.

If there are any objections to building back of the present retaining wall at the park, a new one can be built outside of it, and the sewer placed between the two walls.

The proposed sewer starts from the Park street sewer at grade 33.5 feet above the city base, joins the Laurel street extension at 30 feet, intercepts the Capitol avenue sewer at 28 feet, Lawrence street at 23 feet, Hungerford street at about 22 feet, and Gully brook at 18 feet, giving an average inclination of 1 foot in 516 feet, which gives a velocity of 3.8 feet per second in the 36-inch sewer, 4.5 feet per second in the 48-inch sewer, 4.8 feet per second in the 54 inch sewer, and 5 feet per second in the 60-inch sewer.

According to DuBuat, a velocity of three feet per second is sufficient to move angular stones of egg size, and the velocity in the proposed sewer, while sufficient to remove ordinary deposits, can be increased at every interception by making proper junctions, as most of the connections will be made where a great velocity in the present outlet is given by a sharp descent.

At or near the junctions of the main-service sewers with the intercepting sewer, provision should be made for an overflow of water which floods the sewers during heavy rain-falls, and this can be done by a plan which depends for its success upon the higher velocity of the water when sewers are running full, which causes it to leap an opening into which the ordinary flow would pour, or by building openings or weirs in the side of the sewer above a certain level, and at places where suitable outlets for the overflow can be obtained.

At the High street and Main street junctions (north side), however, gates to close the weir for overflow may be built, in order to make the sewers continuous from North Main street with the intercepting sewer.

From Pleasant street to Park river, the Main street and High street sewers have no laterals, and, by utilizing the flow from this limited water-shed, ample velocity for flushing the intercepting sewer can be obtained.

By reference to the sewer map it will be seen that the Main street sewer starts at Pleasant street, at grade of 63.5 feet, and that will give at Park river a head of 48.3 feet, and at Connecticut river 51.5 feet, in the intercepting sewer.

In excessive rains the overflows should be all opened and the main relieved.

In Table No. 2, the cutting required at Prospect street is stated at 20.1 feet, at Main street, 30.2 feet, and at Daniels' mill 15.8 feet.

It will be advisable to tunnel under Main street, but only for a distance of about 350 feet, and, in the absence of borings, the material to be cut cannot be certainly known.

Near the corner of Pearl and South Ann streets, the rock ledge is at a grade of 0, at Daniels' dam (in Park river), grade of about 15 feet, and in Arch street (opposite Lincoln's foundry), is at a grade of 23 feet. Judging from this the sewer will be in the rock for but a few hundred feet.

The Laurel street sewer should be made the main outlet for the Asylum Hill district, and the outlet at Asylum avenue, west of Woodland street, discontinued.

With this carried out, the only outlets not connected with the intercepting sewer will be at Farmington avenue, and a sewer must eventually be built from that avenue along the north branch of Park river to join the main at Riverside street.

The South Prospect street sewer should be connected with a sewer on Sheldon street, to take the sewage from the buildings that now drain into Park river near Front street.

The sewage from the Taylor street outlet, east of Commerce street, is so thoroughly mixed with the waste products of the Gas Works as probably to render it harmless, but if not, by contracting the river by low masonry dams built part way across, near Front street, the current will remove the deposits now found near Commerce street.

VENTILATION.

A very important feature in this effort for sanitary reform is the ventilation of the proposed intercepting sewer, and, as it covers a question that has not often been regarded in past sewer-work in Hartford, it may be well to consider the necessity for ventilation before stating the method to be applied in this case.

The researches of chemists, the experiments of engineers, the rise of the branch of preventive medicine under the intelligent and careful investigations of physicians, and of Boards of Health have demonstrated the necessity of cleanliness in municipal as well as in personal habits, have suggested the various means to this end, and have warranted the authorities in adopting some one of them in order to prevent unnecessary sickness and death, and in compelling compliance with the laws of health of each individual in the interest of all.

Dr. R. Angus Smith ("Air and Rain," p. 386, et seq.), says, " The tendency of inquiry in modern times has been to establish a very ancient belief that decomposing substances, animal and vegetable, produce disease, and are ultimately connected with infection and contagion. . . .

" It is true that some persons object to these conclusions, and there are even many who have attempted to prove that the gases from decomposing substances are beneficial to health. The fancies or superstitions of the population have somewhat assisted this latter retrograde idea, and we find some delighting in putrid canals and rivers; others admiring the gases from brick-kilns; and others again those from accumulations of farm-yard manure. The pressure of experience, however, is so strong that these ideas will probably soon vanish.

" It has often been asked, will a sewer produce cholera, or plague, or cattle disease? We cannot say so, or that every kind of disease may be produced from such accumulations of organic matter.

"A few centuries back we perhaps had arrived at such progress in filthiness of habits that we attained the dignity of producing epidemics amongst ourselves.

This, however, is sufficiently made out—that, when these diseases do come amongst us, they take root with most effect in those places where decomposing matter is found. It would, in fact, appear as if the putrid matter itself took the disease and transferred it to the living."

Of the various methods proposed to remove the causes of disease, Hartford has chosen the water-carriage system, and the substitution of the water-closet for the privy, and the sink-drain for the cess-pool, was not simply to get rid, temporarily, of unpleasant odors, or to bury out of immediate sight in the sewer the objectionable refuse, but it was intended to be used as the readiest means of removing it all to an outlet where it would be harmless.

The closets, sinks, and sewers are all parts of a "hydraulic machine," that requires care and skill in the designing of all its parts, and through workmanship in the building of its smallest detail.

But in this, as in all machines, the practical are not equal to the theoretical results, on account of the mechanical difference in the application of the principles, of mistakes in their application, and of inferior work in the parts.

The result is that, in all the sewers, deposits are formed, and remain until decomposition ensues, and dangerous gases fill the sewers and drains,—to find their way into the confined air of houses, whenever from a change of temperature, as by the admission of hot water or steam, or from the sudden filling of the sewers by storm-water, or from the blowing of the wind into exposed outlets, or from the warmer atmosphere of the houses, these gases are forced back through the sewer-drains.

"Present experience shows that there is something in the air of sewers that is dangerous to health and pestilent to life itself; and that it is imperative by proper ventilation to dispose of or neutralize the effects of its deadly influence.

It should be laid down as a rule that all sewers must be ventilated, as unventilated sewers may be as dangerous as steam boilers without safety-valves."*

Whether we adopt Liebig's theory that "disease is due to organic matter in process of decay communicating the elements of decomposition," or Pasteur's theory of organized germs, or Richardson's theory of an organic and particular poison formed in the process of disease, the *fact* has been demonstrated by special experiment, and by the experience in fever hospitals, that contagion and in-

* Sanitary Engineering, B. Latham, p. 309.

fection are prevented by ventilation that dilutes and oxydizes the poison with pure air.

The necessity of ventilating sewers has been generally acknowledged, and many methods have been proposed to accomplish the result. The sewers have been connected with chimneys, furnaces, blowers, exhaust-fans, and steam-jets, and chemical re-agents have been poured into them. But the most successful expedient has been the construction of manholes in the sewers, with perforated covers at the level of the streets, and at intervals of from 100 to 200 feet.

In addition to the open manholes, the rain-water spouts have been connected, untrapped, directly with the sewers, and have proved of great benefit, except, of course, during rain-storms, when they are filled with water.

A special pipe for ventilation, connecting with the sewer and extending above the roof of every house, is the main feature in Colonel Waring's plan for ventilation of the "small-pipe system" introduced in Memphis, and considered by many experts as the most sanitary of the various systems now in use.

In London and Liverpool the sewers are ventilated by shafts and gratings opening directly into the streets, at intervals of 100 to 150 feet, by special pipes carried above the roofs of houses, and by untrapped rain-water spouts; in Leeds and Paris by untrapped street gullies; in Frankfort-on-the-Main, "by soil pipes carried through the roofs, by rain-water pipes, and by three high ventilating towers"; in Hamburg, by open gratings in the streets, and untrapped rain-water spouts and street gullies; in Dantzic, and in Brooklyn and Providence, by gratings in the streets.

In every city where this method of ventilating in the streets by manholes covered with perforated covers or gratings has been employed, the results have been most satisfactory, and complaints have been seldom made.

In Brooklyn,* "many of these gratings were examined, and there were only a few where any smell could be detected six feet from the surface of the streets."

This method of manholes built at proper intervals, extending to the street level, and covered with perforated covers, we recommend as the best means of securing the needful ventilation.

And these manholes will be aided in their work by the over-

* "The Sewerage of Boston."—Report of 1876.

flow openings, located near the junction of each main service sewer with the proposed intercepting sewer.

By this method of ventilation the formation of noxious gases in the sewers is almost if not entirely prevented. Such small quantities as may be formed will be so extensively diluted with atmospheric air as to be not only imperceptible to the senses, but also entirely harmless,—the organic substances being completely oxydized,—and the difference between the air in the sewer and the air outside will be almost inappreciable.

The adoption of a thorough system of ventilation for all the sewers now built is of the utmost importance, but that is aside from the present question.

EFFECT OF DIMINISHING THE VOLUME OF THE RIVER.

Another question has arisen in the consideration of the exposure of the river bed, and that is, What will be the effect of the withdrawal, by a sewer, of the water that now flows from the several sewer outlets, and forms a considerable part of the river in dry seasons?

The noxious gases from the ponded sewage aid in the dissemination of such diseases as typhoid fever and diphtheria, and the deposits of filth are thus a constant menace to the public health.

But if this source of danger be removed, the river will be narrowed, and more of its bed will be exposed by its alternate fall after rain storms and freshets. And it is questioned whether the vegetable matter deposited on the low banks will not decay there and breed malaria.

Retain the sewage, and, according to some authorities, we have typhoid fever and diphtheria; remove it, and what is commonly denominated malaria threatens.

This would seem to argue in favor of letting bad enough alone.

But the argument proves too much. There is fault either in the premise or in the conclusion—or in both.

For if both be true, what folly it is to construct a sewer anywhere! The river, in its present condition, would furnish the strongest argument against the building of a sewer in any part of the city!

Individuals are compelled to remove privies and garbage-heaps from their premises, and to connect drain-pipes with unventilated sewers, for health's sake, and yet there is maintained, through the heart of the city, a mammoth privy and cess-pool.

The first duty seems to be to carry out the laws of health, and remove completely from the city limits all danger from sewage.

If another nuisance remains when one has been abated, remove that in its turn, when it appears.

We think the apprehension of danger from this source is not founded.

The only vegetation that can in any quantity be deposited and rotted upon the banks or exposed bed of the stream consists of leaves. And how nearly infinitesimal would be the quantity of these as compared with the quantity decaying throughout the city even in its thickly settled parts! And beyond that, the leaves that the river brings down are mostly carried with the stream to the Connecticut,--and *all* came down at a season of the year which is closed with the cleansing fall rains and the winter froats, which either sweep them (such as are lodged) out of the Little into the Great river, or else kill their baleful influence. And the overflow of surplus storm water, for which provision is made in the sewer proposed, will raise the stream so as to cover its entire bed during every rain, or even copious shower. Finally, should any injury to the public health arise from the cause alluded to, a sure and inexpensive remedy will be found in the construction of two or three low masonry dams across the stream, whereby its level can be maintained at the desired hight.

In considering the main question, it is well to keep in mind that nuisance considered dangerous to public health, and continually increasing in malignity, exists in Park river; and the fact that this nuisance was created and is continued by using the river (which has a small average discharge, and is obstructed by dams,) as a sewer.

There may be many ways of removing the nuisance and the unsanitary condition of the river, by plans that contemplate its continued use as an open sewer, but your committee, after considering the various plans suggested, are settled in the opinion that the cheapest as well as most effectual mode of relief is to be found in the construction of a large sewer through the valley of the Park river, which shall intercept all the sewers now emptying into the stream. The cost of one on the line suggested at about $158,000, for the whole line from Park street, in Parkville, to the Connecticut river. This is exclusive of the Laurel street extension to Farmington avenue, the change in the Asylum Hill system, and the extension through Spruce street of the Gully brook sewer. Add these, and the cost is in round figures, $188,000.

The report discusses the problems presented in all their aspects, and the conclusions reached appear conclusive. The objections against all other plans that have been suggested seem to be vital, and they appear unsatisfactory in the results likely to be attained. The intercepting sewer, if constructed, will certainly remedy all the evils caused by present pollution of the stream. If for no other reason than securing the beauty and health-giving qualities that should inhere in a public park, which is the breathing-place for pure air for the crowded denizens of the tenement houses, who oftentimes have no other recourse, the pollution of the stream should cease, and it no longer be allowed to breathe forth pestilential gases to contaminate the air of its beautiful surroundings. Indeed, in a purely æsthetical sense, as a thing of beauty, this vile, polluted stream, which, like a foul snake, crawls through the park, defacing and marring the impressions produced by the surrounding scene, should be purified, and as a pure, limpid stream, add to the beauty of that which it now defaces.

But when we consider the many to whom this park is the only chance for green fields and clear sky their narrowed and confined lives afford, and especially the sick children of the poor, to whom this should be a source of health and life, to allow this stream instead, in the time of their greatest need, to give out pestilence, sickness, and death, seems almost a crime. Fortunately these evils are in a fair way for correction. The benefits to be derived from a systematic and thorough ventilation of public sewers will also be so thoroughly demonstrated by the construction of this sewer, as recommended by Mr. Burdette, that it will be easy to extend the same method to other sewers already constructed. While it may not be possible to remove all the evils from sewers by ventilation, they can thus be reduced to a minimum, and the openings being so near to each other, but a small quantity of noxious effluvia would escape from any one, even were the sewer filled.

APPENDIX B.

RAINFALL IN INCHES FOR EACH MONTH.

MONTHS.	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	Totals.	Average.
January,	1.64	3.88	5.57	2.87	1.35	3.48	5.28	2.42	26.49	3.31
February,	3.02	3.28	3.40	4.13	5.10	1.73	4.03	1.08	25.77	3.22
March,	3.01	2.44	1.25	4.85	8.79	6.93	3.28	5.78	36.33	4.54
April,	1.66	2.07	7.12	3.53	3.40	2.71	4.83	5.36	30.68	3.83
May,	2.67	6.36	4.15	1.70	4.29	0.61	2.71	1.84	24.33	3.04
June,	3.58	0.18	4.05	3.23	2.07	4.68	5.27	4.60	27.66	3.46
July,	5.48	1.65	4.92	2.51	7.44	3.17	4.82	4.05	34.04	4.25
August,	7.29	4.52	5.78	6.65	0.30	6.80	4.67	8.10	44.12	5.51
September,	3.71	2.74	2.19	2.23	4.93	1.27	2.23	2.84	22.14	2.77
October,	2.86	4.42	1.23	2.91	0.81	7.79	2.17	1.20	23.39	2.92
November,	4.45	4.05	2.70	3.26	3.56	5.41	5.00	2.10	30.53	3.82
December,	3.60	5.31	1.74	1.18	4.38	0.97	6.34	4.30	27.82	3.48
TOTALS,	42.97	40.90	44.10	39.05	46.42	45.55	50.63	43.67	353.30	

Yearly average, - - - - - - - - - 44.16

OF 600 STORMS FROM SEPT., 1871, TO OCT., 1880.

In 352	the rainfall was at rate of	.05	inches per hour.
" 140	" " " "	.05 to .10	" " "
" 54	" " " "	.10 to .20	" " "
" 22	" " " "	.20 to .30	" " "
" 7	" " " "	.30 to .40	" " "
" 7	" " " "	.40 to .50	" " "
" 2	" " " "	.50 to .60	" " "
" 3	" " " "	.60 to .70	" " "
" 6	" " " "	.70 to .80	" " "
" 4	" " " "	.80 to .100	" " "
" 1	" " " "	1.01	" " "
" 1	" " " "	1.10	" " "
" 1	" " " "	1.16	" " "

SEWERAGE OF NEW LONDON.

The discussion of the sanitary condition of New London and the laws and principles involved in securing a proper hygienic condition for the city, involves so many points that are as true of many other cities and large towns that it may be in many respects considered as the type of a class. The principal features in common are the possession of a plentiful supply of pure water supplied by a company or corporation of some sort, and the lack of any systematic drainage or sewerage, the pollution of air, soil, and well-water where used, by privy-vaults, cess-pools and neglected garbage and refuse, and the accumulated effect of these agencies having been in operation for a long time. There are also certain peculiar sanitary evils and modifications of the general effects summarized. We have, too, what is true of all such places, an undue prevalence of zymotic diseases and recurring epidemics of greater or less malignancy.

The outbreak of diphtheria here last summer, its malignancy and consequent fatality, induced a thorough survey, especially with reference to the advisability of sewers and the probability of relief from a system of sewers. There were 89 deaths from diphtheria, mainly of children under ten, for the most part from one to five. The mortality, as near as could be learned, was one in five. There were, therefore, at least 400 cases, and doubtless many more of a diphtheroid character, but few adults were attacked. The registrars' reports of England and Canada, as well as of Connecticut, show that diphtheria is for the most part a disease of the country, and if we find epidemics in the city, there must be some great sanitary defect. It is indeed a matter of record, that, wherever epidemics, not alone of diphtheria, but of zymotic diseases generally, occur in a city, there is some neglect of sanitary requirements, the better the sanitary condition the less the number of cases and the fewer and milder the epidemics. The question then arises, what was the cause of the epidemic of 1880? The result

of the careful study of the causes, results in the answer of *filth*, the contamination of the air on a large scale by the emanations from putrefying excremental and vegetable refuse. The pollution of the soil by infiltrations from drains, cess-pools, and privy-vaults, and the poisoning of such well-water, as was used from previous soil pollution or direct infiltration from closely adjacent accumulated and stored filth and fœcal matters.

In New London we find therefore the sanitary evils of the country aggravated by a much larger and denser population. The preference of the disease for tenement-houses and its malignancy, heightened by local additions to the general agencies, as the cess-pool on the hill-top, for example, with eight fatal cases closely adjacent; as I remember the two houses both opened into the same yard, illustrates the increased danger from density of population. As this epidemic is so recent and its mortality so large in a city of eleven thousand inhabitants, eighty-nine deaths in a few months from one disease, attention has been very generally called to local unsanitary conditions that may have acted as causes. A very careful study of the sanitary condition of the city has therefore been made, aided by experts both within and without the city, with especial reference to prevention of future trouble. While the unsanitary conditions are fully described it must be constantly borne in mind that many of them are to be found in other cities and large towns, followed sooner or later by similar epidemics of some form of zymotic disease. The closer are such conditions investigated the more intimate is found to be their relation to the causation of disease. The element of contagion must not however be forgotten, in spreading disease, it is against their sources however we are contending. In New London in 1880 the deaths exceed the births by nearly thirty, there having been 259 births reported, and 282 deaths; 150 of these deaths were of children under ten, 99 under five years of age, about 39 % of the total mortality, an increase of 9 % over the usual average.

There is, however, one peculiar unsanitary condition of New London, that is not often found to such an extent elsewhere; I refer to the ditches covered and uncovered, that are made to do the duties of sewers and cess-pools both, they are indeed often but elongated cess-pools contaminating both air and soil. The accompanying map shows these very plainly; for distinction they are printed in red, the contour lines are also given so that any one disposed can study out the whole problem of the drainage at their

leisure. As will be readily seen, there are few cities better adapted for the separate system, the small sewer system, of Col. Waring; this was our opinion and to confirm it the services of Col. Waring were engaged, also his opinion as a sanitary engineer upon the needs of the city was asked; his report follows this discussion. The storm-water can readily be disposed of without detriment, and indeed is serviceable in cleaning the streets and gutters, so that only the sewage proper and the manufacturing waste need be provided for.

To return to these peculiar drains, they are as seen at a glance, quite extensive and for the most part, are the natural courses of small brooks straightened oftentimes, for convenience, otherwise following their old ways. The amount of water passing through them is not, however, enough to maintain an invariably unbroken stream, and deposits of organic matter are made from time to time in both covered and uncovered drains giving out emanations that can be smelled, I am told, long distances away from the source. As the bottom and sides of these are often porous soil, a constant infiltration and pollution is taking place. The luxuriant vegetation at intervals, where chance allows its growth, testify to the enrichment of the soil. Often tile drains empty into these and the sewage from water closets is added to that from sinks and manufacturing waste. The most notorious of these last summer, perhaps was that leading from the canning factory, when the season for work commenced here, large quantities of waste from the skins and seeds of the tomatoes were piled up in the rear of the establishment in its shallow cellar and ran in a constant stream along the ditch leading from it shown in the map, leading from Hempstead street across Jay, running nearly parallel with Canal to the water. Near Jay street a tile drain empties into it, commingling vegetable decay with sewage, the stench from the opening near the sidewalk was very offensive, as would be supposed. A fatal case of diphtheria marks the junction, the house standing but a few rods back and draining into the tile drain. A few rods distant was the school-house which was said to drain into this ditch. The relations of these conditions, in the cases of diphtheria adjacent, are best seen on the smaller map, where the cases are located by W. H. Richards, by whom the map was drawn. To avoid confusion the larger map shows the contours and location of the present drains. The location of the fatal cases of diphtheria is given on the smaller map.

AM. PHOTO-LITHO.CO. N.Y. (OSBORNE'S PROCESS.)

Besides the soil pollution already described, and the vile odors that contaminated the air for wide areas, these drains create a nuisance at their outlets, as they for the most part discharged in shallow water. The vile mass accumulated is exposed to the air at low, or even at half-tide, giving rise to a condition of affairs that is better imagined than described. When they discharged into the docks, the conditions were a little better, but a deposit of varying thickness was formed, which was not washed out by the tide, and added its quota to the contaminating influences. The sewage that found its way into the upper portion of the coves was an especial nuisance, as the water deserts this portion early in the day. It is more than probable that some wells were also polluted by these drains, as well as by cess-pools and privy-vaults.

Heaps of refuse, ashes, kitchen-garbage and house refuse add to the pollution of the air in all places where neglect allows them to accumulate. The use of such material to fill up low places, or to make land by filling in bays, coves, and the like cannot be too strongly deprecated; continuous fermentation goes on in such soil for years, its emanations causing disease where dwelling-houses are occupied or built upon such land. In tracing the course of these drains one peculiarity was noticed—they in several instances pass under houses, and through private grounds; often underneath the windows of sleeping apartments, creating a disgusting nuisance by their vile emanations. In one instance, a high building was on the corner of the street, next to it a shop, directly back of which and not two feet distant was a two-story building, shaded completely in front by the shop on one side, nearly as badly by the high block on the corner, with still a third building—a stable from appearance—was on the other side. To reach it one went through a narrow alley-way between the shop and the adjacent building. This house, if it deserves the name, was wedged in among tall buildings, with a small yard on one side only; no sunlight, and scarcely even air could reach the rooms on the other sides. The open ditch ran under the shop, and under the kitchen floor, (there was no cellar) allowing free entry of the disease-engendering gases that emanate from the putrefying contents of the drain to all parts of the house. A fatal case of diphtheria had destroyed the last child; typhoid fever had found its victims there previously, and acute rheumatism was inflicting its tortures upon one of its inmates at that time. This place was a regular death-trap, and there should be laws that would forbid letting it

to human beings. It was not uncommon to find the drain passing under houses which sometimes had cellars, usually not, however. The menace to health and life such elongated cess-pools present, is evident.

The cess-pools perhaps deserve mention next among the unsanitary conditions; most of these might be styled self-draining, that is, the percolation of their contents through the sandy and gravelly substrata is depended upon to dispose of their contents. They are hermetically sealed, and never opened. The pollution of the air of houses incident to this construction of cess-pools, has been fully illustrated in the article on rural hygiene, printed for general distribution, but reprinted in our second annual report. The evils of sewer-gas in the houses are thus secured, only it is your own filth, not that of your neighbors that comes back through the untrapped waste-pipe to mingle with the air breathed. Other cess-pools are cleaned more or less frequently; few, if any are cemented or have tight walls. The soil is so porous that if the cess-pool is entirely neglected, there is no danger of its becoming full. In fact, house drains end blindly in the porous soil; oftentimes satisfactorily, in so far that no trouble is encountered in disposing of the waste. A large tract of rather low land was filled in with loose stones at first, then gravel or ashes from the dumping-carts—perhaps afterwards loam, and it is sodded over as a kind of common park. I was informed that drains conveying all the house-sewage from water-closets and kitchen sinks were carried to the edge of this tract, and a sufficient outlet was afforded if the end of the drain were left open, and the whole covered up—perhaps a few flat stones just at the mouth of the drain were used to prevent the finer soil sifting down and choking the drain. What a sanitary subsoil will eventually result if this practice continues and extends. Other house drains empty in porous soil in a similar manner, or upon the surface, but conveying kitchen waste only.

The pollution of the soil, especially of the substrata, and incidentally of the water in the wells, and the air generally, results—1st, from a peculiar set of drains now open, now shut, which receive sink-drainage, excrementitious sewage from water-closets, manufacturing waste, and in certain portions, and in some parts of the year, enormous quantities of vegetable waste. The latter condition has for the present been rectified. These drains have porous sides and bottom, allowing infiltration of the surface soil when they run near the surface, and of the substrata when their

course is deep. The extent and character of this soil infiltration was shown to some extent when the brook from the canning factory was dug out and straightened, widened, and deepened in some places. The soil was almost as offensive as if it were putrefying filth instead of soil. The conditions in more porous substrata may be estimated where the course of the stream was impeded. 2d. House-drains, sink-drains, and what may be termed self draining cess-pools, and larger accumulations where occasional emptying is requisite, also blind drains, that is, drains opening into the porous soil and conveying sewage from houses; these are practically cess-pools. 3d. Numerous privy-vaults. 4th. Garbage and refuse heaps. The only condition peculiar to New London is found in the first; the drains that have been pretty fully considered. Many of the evils of sewers are produced by these drains, their influence in polluting the air perhaps has not been strongly enough stated. In summer especially, they are practically elongated cess-pools, with putrefying contents from end to end, and a bed of decomposing filth at their outlets. That they are malodorous none can deny, their influence in disseminating the seeds of diphtheria, so to speak, is plainly shown by the diphtheria map accompanying this article. Were all the cases shown, as well as the fatal ones, the course of these drains would be much more sharply accented. In conveying the germs of disease therefore, they act as badly-constructed sewers would, and also predispose to disease by the vile gases of decay they pour into the air. In dry seasons all these influences are more potent, as the less the volume of water in these drains the greater the putrefaction and air pollution. In one instance a drain runs under the floor of a large mill; this room often has to be abandoned I am told, on account of the odor from the drain. Cases of typhoid fever have justly been attributed to the close vicinity of these drains. Indeed, if a map of zymotic diseases were made, no doubt it would be more impressive than the showing from diphtheria. These cases are, however, recent and impressive from their number, but the unnoticed influence of such unsanitary agencies is many times worse than the most malignant epidemic. In dry seasons also the seepage into wells from privy-vaults and cess-pools is worse, because less diluted—that is, in a given volume of water the proportion of adulterants will be greater. The exhalations into the air are of course greater, and they remain longer; every rain washing the air dissolving all these noxious gases of decay, con-

veying them to the leaves and rootlets of plants where they act beneficially, and washing down too the floating particles of excrement that the heat and wind had set floating. No wonder that the air is so refreshing after a rain in summer.

Owing to the topography of the city, dividing certain portions into flats, as it were, the inhabitants on the lower levels are very liable to receive unsanitary influences from their higher neighbors. This is particularly true of soil and water-contamination, indeed of air also, for that matter. Fortunately, the city is abundantly supplied with pure water, otherwise the effects of the conditions described would be much more impressive. The well-water is however occasionally used, hence reference is made to its pollution. The liabilities of those on lower levels to contamination are more marked when tenement houses with their accompanying vaults and cess-pools are crowded into small lots which back up against each other. The underlying rock formation guides the contaminated water, as of course but little soaks into the ledges. The outbreak of diarrhœal disease last summer, forty cases or more of people working in one locality, all or nearly all using water from a certain well, is a case in point. Analysis some time after it is true revealed nothing, but the water in a well constantly used changes rapidly; even from the same well at different levels it is found to be of entirely different character. Analysis of two specimens thus, one from the top of the water in the well, the other taken from near the bottom, have given entirely opposite results. Surface drainage had run in, contaminating the upper layers, while that below was perfectly pure; one specimen was therefore condemned as unfit to drink, the other eulogized for its purity.* At first discredit was thrown upon our examiner; it happened the specimens were sent to different parties, until the case was investigated. It is not always that chemical analysis reveals the causes of disease in water, even the microscope oftentimes fails, so that the *onus* of causation must rest upon the drinking-water for the present.

This rock formation, cut into plateaus as it were, aids the pollution of soil and water by restricting the amount of soil to act as a deodorizer, and allowing the foul water to be spread over greater areas than if it sank deeper. It must be remembered, in discussing soil-contamination, that liquids from the surface sink into the ground if of sufficient volume, and especially in a porous soil until the level of the ground water is reached, and then spread in all directions, sink-

* Wanklyn.

ing no further except by the diffusion of liquids. This rocky foundation has the same effect as an elevation of the ground water-level, bringing it nearer the surface, thus rendering soil-contamination easy. It will readily be seen also how much more likely the wells are to be polluted by this spread of the liquid filth in the soils. In addition to the sources of soil-contamination already mentioned the dangers from contamination of the wells from surface-washings must be added; this is greatest of course where a well receives the surface-water from higher occupied levels. Fortunately the use of well-water is never a matter of necessity, although it was said, as a matter of choice in the scarcity and high price of ice, that well

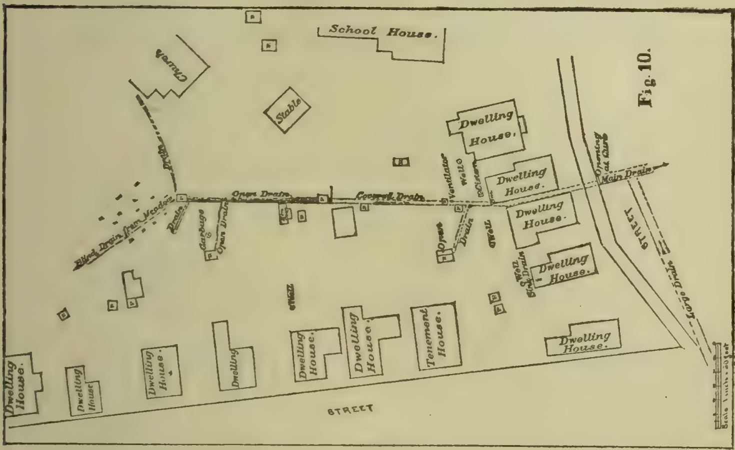


Fig. 10.

water was used during the past summer because it was cooler than that from the hydrants. There was also at one time a bad taste in the city water that may have induced the use of well water to some extent. The well-water was used more or less then during the summer, and doubtless added its influence to the others.

Sometimes the privies are but a few feet from the house, or attached to it; a few instances they are in cellars, a nuisance to health in every respect, discharging their poisonous effluvia directly up through the house, both sitting and sleeping-rooms. Owing to the differences of level, we occasionally find the vault but a few feet from the window of a sleeping-room of a house below. The illustration shows how thickly these vaults are sometimes crowded in a small area, especially when back lots join, forming a sort of

cul de sac. The cess-pools and openings of drains are not indicated; the drain shown empties into that from the canning factory after receiving tile drains from several houses. These vaults by slow percolation saturate the surrounding subsoil so that it no longer acts as a deodorizer or purifier, and the area of this saturated soil around vaults and cess-pools slowly increases from year to year. These conditions are not peculiar to New London; in every epidemic of diphtheria or typhoid fever that I have investigated, I have found pollutions of the soil. The conditions found in Norwich last year and in Meriden are in point. Indeed it is a matter of record that wherever there is a malignant epidemic of zymotic disease, some decided sanitary defect is invariably found, which fully explains the conditions that result.

The following illustration shows the relation often discovered

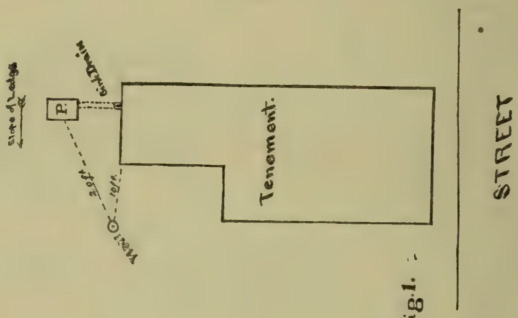


Fig. 1.

between the sink-drain, privy-vault, and well, although even closer proximity was not indiscoverable; sometimes a cess-pool should be substituted for the sink-drain, it then becomes a type of a large class. There is no greater menace to health than the stored fecal matter of privy-vaults, next to this are to be ranked cess-pools. In the former are preserved indefinitely the germs of disease, that may at any time find their way into circulation. The sub-irrigation system is infinitely preferable to the cess-pool, and practicable wherever there is a small lawn. For a city of this size, sewers are a matter of almost vital necessity; they cannot afford to furnish the conditions for a malignant fever to decimate them, and the obvious way of prevention is to remove the filth at once, instead of storing it up to breed disease.

In the case of seven deaths on the hill-top, a foul cess-pool con

nected with one of the tenement-houses where three of the children died and within a few rods of where four others died along the outlet was a *cul de sac* caused by a projecting point of rock where filthy water was retained in which children sometimes dabbled and played. In exploring the region apparently healthy and well-drained indeed, on the top of a high hill I noticed this small pool of filthy water and called attention to it; on investigation it was found that when full the cess-pool overflowed, leaving foul water here, also when emptied a deposit was left here, in addition to the foulness of the cess-pool itself. The following remarks by Dr. Lindsley upon cases in New Haven are in point here in the discussion of causes.

In the mortality statistics for the month of November in New Haven the most marked feature was the fact of sixteen fatal cases of diphtheria and membranous croup. As compared with any previous month for more than two years this indicates a large increase in the prevalence of this disease. The victims were all children, a large majority being under five years of age. The sixteen fatal cases occurred in as many different houses. They were scattered as widely as possible in every direction, but occurred almost wholly in portions of the city remote from the center. Sanitarians are already agreed that among the causes of diphtheria, filth is the most prominent factor. It is generally called a filth disease. By this is not meant simply dirty faces and hands and soiled clothing, but that the victims of this disease have been living surrounded by such accumulations of filth that the air of their houses has been poisoned by the emanations from it, or their drinking water.

In this view, it is of interest and deep concern to inquire what agency such conditions have had in the present outbreak in our city. Every house in which a death has occurred has been visited and carefully observed by the sanitary inspectors of the board of health. Their reports are all in close accord with the theory that this disease—except in cases of direct contagion—is always associated with foul air or water from filthy surroundings. The infected houses were, for the most part, on streets in which there are as yet no sewers. Only three of the houses were connected with the public sewers. In one of these the only defect detected was imperfect ventilation of the water-closet in the house and of the drains. In this case, however, a vacant lot in the near vicinity had been used all the season, as a place of deposit for all sorts of

refuse, and at times the stench from it was offensive. In the other two houses with sewer connections there were no intervening traps to obstruct the passage of sewer-gas directly to the interior of the house. In one of these were four kitchen sinks—none trapped. Of the remaining thirteen houses, nine stored up their kitchen slops in cess-pools, which were wholly unventilated, but connected by drain-pipes directly with their interior apartments, thus effectually securing the passage of all cess-pool vapors through them. Some few of these were enjoying a fancied security, because their sinks were trapped with a bit of bent tubing, but one might as well trap the neck of a bottle and expect to fill it with wine and not drive out the air that was in it. If cess-pools are tightly covered over, it is quite evident that the gases made in them will escape through the pipes and drains leading into them, and no trap can stop it. At the remaining four of the sixteen houses, the kitchen slops and other refuse were merely thrown out the door upon the surface of the ground. The privies were generally overfull and offensive; sometimes located, as well as the cess-pools, in dangerous proximity to the wells.

The above general descriptions were in some of the houses diversified by additional facts, such as the keeping of hens in the house, cess-pool overflowed into the cellar, cellar dark and wet and wholly unventilated except by trap-door in basement floor, yard small, low, wet and sloppy.

In no house where death had occurred from these diseases did there fail to be abundant cause for a foul and poisoned atmosphere.

It is the belief of the best sanitarians that diphtheria cannot possibly become epidemic in a community where the atmosphere is pure and a good state of public hygiene is maintained.

Dr. Snow, the venerable health officer of Providence, says in his report last month: "With regard to the causes of diphtheria and typhoid fever in cities, they are well understood; indeed it may be said that they are positively known at the present time. They are impure air or impure water, the impure air generally arising from collections of sink-water or from privy-vaults. These are causes that can be prevented or avoided in nearly all cases; they are causes that in cities, almost without exception, exist in the houses, or in the immediate proximity of the houses where the diseases are found. If these causes are allowed to remain in or about any house, cases of diphtheria or typhoid fever in their season may be expected to appear in the same house. The converse

is also true, that if cases of diphtheria or typhoid fever do exist in any house, it is proof positive that the causes of the disease also exist in the same house."

It is doubtless due to the generally good sanitary condition of New Haven that the disease is not epidemic. It exists on every side of the city, and will spread wherever it can find the necessary conditions for its propagation.

It is believed by those who have the best means of knowing that our city is thirty to fifty per cent. cleaner than it was before our sanitary inspectors began their systematic work of looking after unsanitary places. There can be little doubt they have saved many a household from an untimely bereavement. Ought not their number to be increased?"

It will be remarked that while there were fatal cases, these did not act as foci or centers of disease. Indeed, malignant cases were reported in many places where all the children in one family died, but the pollution of air, soil, and water that has been illustrated in New London did not exist. Hence no epidemic. However well ventilated buildings may be, if the outside air is tainted with the emanations from privy vaults, or loaded with excremental particles, and cess-pool effluvia, all appliances are futile for preserving health.

In marked contrast to these conditions was the localized epidemic in Meriden. Here we have similar conditions to those in New London. In the region where the diphtheria originated there is a narrow stream running behind a row of tenement-houses. On this stream is a row of privies, and these are used by a crowded tenement population. The stream is but three feet wide at its widest, and often choked up almost entirely by the deposits which the sluggish currents were unable to remove. In a limited area the conditions that are prevalent in the tenement population of New London were repeated here with the same results. This condition of things, I am happy to state, no longer exists there. The radical improvement of the whole neighborhood had already been determined before this outbreak, and the occurrence of the disease only emphasized the lesson already partially learned, that the removal of filth prevents disease. The last family I attended with diphtheria illustrate the same point on a small scale. There were five successive cases in the children, and diphtheroid sore-throat in case of the mother. An unventilated water-closet was in a cupboard in the middle of the bedroom, foul-smelling at all times from constant use by so large a family of little ones, and not protected

from the sewer. Carrying the soil-pipe to the roof would partly remove the evils. The location itself is, however, faulty. The map illustrates forcibly the relation of these drains to the disease. Each drain almost is a center for malignancy, and notably near the outlet. As plainly as if the finger of Fate had pointed its course, we see the center near the foot of Canal street; again around the outlet-drain between Brewer and Tilley streets; and most marked of all around the outlet of the Church street drain. This association is not accidental. A similar local condition accounts for the seven fatal cases on the hill-top, while local conditions and contagion readily account for the scattering cases. This grouping of the malignancy is marked, and appears more plainly when put upon the map than it did in tracing the fatal cases from house to house, as I visited personally all these infected quarters.

There is little if any room for doubt that a thorough sewerage of the city would remove these evils. The outlets of the sewers should be carried, however, beyond the line of the docks, so that there should be no deposits there. The cost of the small-pipe system is comparatively so much less that this need no longer be a formidable objection. The experience of Memphis has demonstrated the practicability of the scheme, and its superiority over the plan of mixing the sewage and storm-water. This plan is fully described in our second report. As it provides for complete ventilation of the sewers, all the objections urged against poisoning by sewer-gas are obviated and thoroughly set aside. Even with all the confessed evils of the other system the city would be repaid for the expense of sewering the city by any plan, as the present evils are likely to go on increasing from year to year. Briefly stated, the separate or small-pipe system starts with a six-inch drain-tile, and gradually increases in size, as the volume of the sewage increases, until in the mains eighteen to twenty-inch pipes are used. The laterals are flushed automatically by flush-tanks gauged to empty at requisite intervals, and at every house the soil-pipes are carried up through the roof for ventilation. The only essential condition is plenty of water for flushing, and that New London has.

Col. Waring's report will be found to discuss several of the points here mentioned. It, with the recommendation for a complete sewerage of the city, is respectfully submitted to the citizens of New London for their earnest and thoughtful consideration. Sooner or later the city must be sewered, and it would

seem that the present evils were severe enough to demand prompt action. The greatest objection, inordinate expense, is removed by the adoption of the new system, which has apparently demonstrated its superiority over all other methods.

The dangers from these unsanitary conditions are not liable to decrease. Indeed, the opposite will be the result. From its situation, New London ought to be one of the healthiest cities in the State, and there is no reason why epidemics should ever occur if these deficiencies are radically dealt with. The city has secured one sanitary essential—an abundant supply of pure water. Unless, however, a drainage system be added, a condition inviting malaria will be likely to ensue, as everything that tends to raise the level of the ground-water, bringing it nearer the surface, may be said to favor the existence of malarial diseases. There is no apparent connection between the existence and spread of malaria in this State, with pollution of water or soil. The typhoid element may be thus superadded, and, by the way, typhoid fever is a disease almost unknown in a well-sewered and drained town, and would soon almost disappear from New London after the sewers were introduced. Malarial diseases, so far as any law can be deduced, invade new territory where natural drainage is markedly interfered with, as by the raising of dams, the ponding of water, extensive embankments, as for a railroad,—in a word, the retention of water in the soil, and delaying its onward march towards the sea. Great confusion often arises from confounding the causes of such diseases as typhoid fever, diphtheria, and the like, and the intermittent fevers or malarial diseases. The latter are not, strictly speaking, filth diseases, unless one attributes them entirely to vegetable decay, which is untenable, as we find them on the high mountain plateaus, where decay of any kind is almost unknown. The ground-water theory, however, is universal almost, or more nearly so than any other offered. It is, in brief, that malaria is favored if not caused by alterations in the level of the ground-water; and, other things being equal, the nearer the level of the ground-water to the surface, the more favorable the conditions for the production or existence of malaria. Abrupt and irregular alterations of level and obstructed flow are nearly equally favorable conditions. The existence along river courses of the disease, its appearance soon after the causes mentioned are set in operation, as the first cases originating in Hartford in 1871, following the construction of the dyke for the Valley railroad, and in its close

proximity. Were the question under discussion, instances might be multiplied. This reference to causation is to prevent confused thinking and reasoning on the sewer problem. The following report of Col. Waring presents the opinion of an expert.

THE SEWERAGE OF NEW LONDON.

Dr. C. W. Chamberlain,

Secretary State Board of Health, Connecticut:

Dear Sir: In conformity with your instructions I have visited New London and gone carefully over the whole of the city, with which I was already quite familiar.

As I understand that you are receiving from other sources an accurate account of the very unsatisfactory sanitary condition of that city, it is not necessary for me to say more than that it seems to me eminently necessary that some radical improvement in the manner of disposing of its domestic and manufacturing waste be undertaken at once.

It has one feature so peculiar that I cannot avoid calling attention to it again; that is, in the effort to drain some of the lower land, and to carry away surface-water accumulating at the foot of slopes, a number of stone drains have been constructed, some covered and some open. As the convenience of the community has required it, many private house-drains and some drains which are almost worthy to be called sewers, have been delivered into these very unsatisfactory channels, which, from their slight inclination, and the roughness of their floors and sides, have accumulated solid filth to an alarming degree. The matter so deposited undergoes, especially in warm weather, an active decomposition, and the stench arising therefrom finds its escape, in the case of the covered drains, only at the untrapped gully-holes, where gutter-water is taken in. Undoubtedly this use of these drains has also led to a very considerable pollution of the soil. In addition to this, and as a much more general and important source of soil-pollution, privy-vaults and cess-pools are in use throughout the city, and the mis-named "odorless" excavator is employed for the removal of such of their contents as do not escape into the ground.

You ask me to report, whether or not the city may be easily sewered, and whether or not it is susceptible of the application of the small-pipe system.

It seems to be the universal opinion of the officials and citizens whom I consulted that it would be entirely safe and satisfactory

to deliver the sewage into the deep water of the channel at the end of the pier next south of the railroad ferry. If so, a very serious element of the work would be satisfactorily provided for. I have, myself, some doubt as to the permanent adequacy of this outlet; but by delivering the sewage at this point the immediate difficulty would be overcome, and, in the event of other means of disposal being found necessary in the future, little if any of the work would have to be modified for that purpose. It seems prudent to recommend such an outlet for the present, bearing in mind that it may sooner or later become necessary either to extend the outlet some distance into the river or to deliver the effluent by mechanical power to a more distant point of disposal.

So far as my preliminary examination has enabled me to decide the question, I am disposed to think that the most satisfactory plan would be to build two intercepting sewers, one from the western end of Bank street—say from about its junction with Truman street, following the street to about the foot of Brewer street, and then running along the flat land near the shore between the foot of the hill and the New Haven railroad as far as the point of outlet; the other intercepting sewer from the junction of Main street and William street, following the line of Main street to about Mill street, and thence running near the shore all the way to the point of outlet. The location of both of these intercepting sewers will require much study; but there is certainly no insuperable difficulty in the way of their proper and economical construction. It would be necessary to build them with extremely slight fall, and to depend on copious flushing to keep them clean. Fortunately the brook running from the old ice-pond to Shaw's Cove will furnish an ample supply of water for a flush-tank at the head of the Bank street sewer, and the ice pond near Bayonne street will in like manner be serviceable for the flushing of the Main street sewer.

The flushing water ought in both cases to be held back in flush-tanks, to be delivered suddenly at intervals. Such a stream as would be delivered by a 1-inch pipe would in each case be amply effective.

The only remaining difficulty in the case is in the very considerable amount of rock that would be encountered near the surface. This obstacle has been overcome in the construction of the water-works, and it can be, in like manner, overcome in the construction of sewers. It will necessarily add considerably to the cost of the work.

To offset the difficulties above referred to, we have the important fact that the grades in nearly the whole city are quite steep, and that the consequent velocity of the flow of the sewers will make it possible to adhere to small-sized pipes over nearly the whole area. Also that in those localities where rock would be encountered the slope is generally so steep that satisfactory drainage would be given to the houses by very shallow sewers at these points.

On the whole, offsetting the disadvantages with the advantages, there certainly is no reason to suppose that the work would be especially difficult, nor that especially costly.

In answer to your second question, I would say, most decidedly, that the city is perfectly adapted to the application of the small-pipe system; and that all of the advantages claimed for that system under any circumstances will have their full effect here. The water-pipes are carried throughout the city, so that there would be no difficulty in obtaining a supply for flushing at the head of every sewer. The steep grades would aid very much in the ventilation of the sewers, and,—which is very important—the delivery of all the sewage would be, owing to the steep grades, so immediate that there would be even less reason than usual to apprehend decomposition within the sewers; furthermore, the sewage would be delivered in such a fresh condition at the outlet that it is quite possible that there would be no perceptible fouling of the river, even after the whole area shall have become densely built over. In fact, it is more than probable that the sweep of the tide, at the point where I have suggested the placing of the outlet, would be sufficient to cause the complete dispersion of all organic matter delivered into it.

There are several sewers now existing in the city which it may be well to retain. The only question about it, relates to the manner in which these works were constructed. The sewer in Federal street, with its extension and its branches, is eight inches in diameter, which is sufficiently satisfactory; but if its joints are not so tight as to prevent the escape of sewage into the ground, its most important office,—the complete removal of foul matters, and the prevention of pollution of the soil,—is not performed. I would suggest that this sewer be very carefully inspected, and that if found faulty in this regard, that it should be thoroughly repaired.

This sewer now delivers at the bulkhead line in Winthrop's

Cove, which is a most undesirable point of outlet. Too much pains cannot be taken to prevent the admission of foul drainage into this cove, as much of its bottom is exposed at low water, and as it is practically unflushed by the tide, or by the stream running into it. The Federal street sewer should deliver into the intercepting sewer above suggested.

The State street sewer may or may not be in satisfactory condition; and this can be determined only by inspection. As it is twelve inches or more in diameter, and as it serves only a very small drainage area, I should much prefer to see it removed and replaced with vitrified pipe of the proper size. It now delivers at the bulkhead line near the Groton Ferry. Its effluent is offensive, and the matters which it deposits accumulate in front of it. This sewer, or any sewer substituted for it, should deliver into the proper intercepting sewer.

It would be quite premature to attempt to form anything like a close estimate of the cost of carrying out a complete system of sewerage, with the use of small pipes, flush-tanks, etc. But as it is desirable to give some idea on the subject, I have roughly calculated that the complete sewerage of the thirteen to fourteen miles of streets within the city, as shown by Mr. W. H. Richards' drainage-map, would not exceed $100,000, including the cost of the intercepting sewers and their appurtenances, and the cost of carrying an outlet pipe fifty feet beyond the head of the pier.

In addition to the sewerage of the city, it seems to me important that a radical improvement should be made in the manner of surface and subsoil-drainage in those few localities where special provision is necessary. Ordinarily, the flow over the surface of the streets is very good, and it will be a simple matter so to arrange the discharge of the gutters as to cause no inconvenience, if indeed any inconvenience is now caused thereby.

But at several points the whole surface is low and its natural drainage is inadequate. This is especially the case in the southern part of the city near Howe's Cove, where the rough-stone drain (sometimes open and sometimes covered,) serves for the outflow for a considerable area. In this case, as in all others, where there is a tendency to undue wetness of the soil, there should be a good and reliable covered conduit or under-drain, not communicating with the surface, but serving simply to remove soil-water and to receive the percolation of the rainfall. This drain should be guarded against the admission of foul matters of any sort, and

should do no work but the mere draining of the subsoil. Doubtless much of the surface-water which now finds its way into these stone drains may be diverted and made to flow through to street gutters. So far as it cannot do so it should be led away, not in a deep cut, but through a grassed or paved depression of the surface, barely sufficient for its discharge; and ordinarily, except during and immediately after rains, quite dry. It is impossible for me now to prescribe at all in detail the manner in which this work should be done, but it would be a very simple and inexpensive matter. The present condition is certainly most objectionable. This sort of drainage in New London, wherever it has been carried out, is evidently an inheritance from the former village condition of the city. It is a sort of work which does much mischief in villages, and whose mischievous tendency increases as population becomes more dense. As an element of the engineering work of a city it is simply disgraceful.

To sum up, I would say that while the sanitary condition of New London is now evidently very bad, it will be an easy and by no means a burdensome matter to make it absolutely good. The especial ends to be attained are:

First, the immediate and absolute removal beyond the limits of the city of all manner of domestic and manufacturing wastes. This can be perfectly accomplished by a system of small sewers constructed substantially after the plan of those recently introduced in the city of Memphis.

Second, the adequate drainage of the soil in those few districts where this is needed. This can be accomplished by the use of independent under-drains, and by such surface works as would lead to the rapid removal of the rain-fall.

It hardly comes within the scope of the question as presented to me, but I venture to suggest that the city government might with advantage be empowered to pass ordinances similar to those adopted in Memphis, making connection with the sewers compulsory; regulating the manner in which such connections shall be made; compelling the cleansing and filling up of all privy-vaults and cess-pools, and prohibiting the disposal of any manner of refuse on the ground or under the ground, or anywhere else, except into works connected with the sewers, or into the proper receptacles for garbage.

From the excellent character of its soil, and its unsurpassed situation, it seems to me that New London need look to nothing more than is herein suggested, to secure the most absolutely healthful conditions possible to a New England community.

Very respectfully,

GEO. E. WARING, Jr.

New York, Nov. 6, 1880.

THE

HYGIENIC CONSTRUCTION

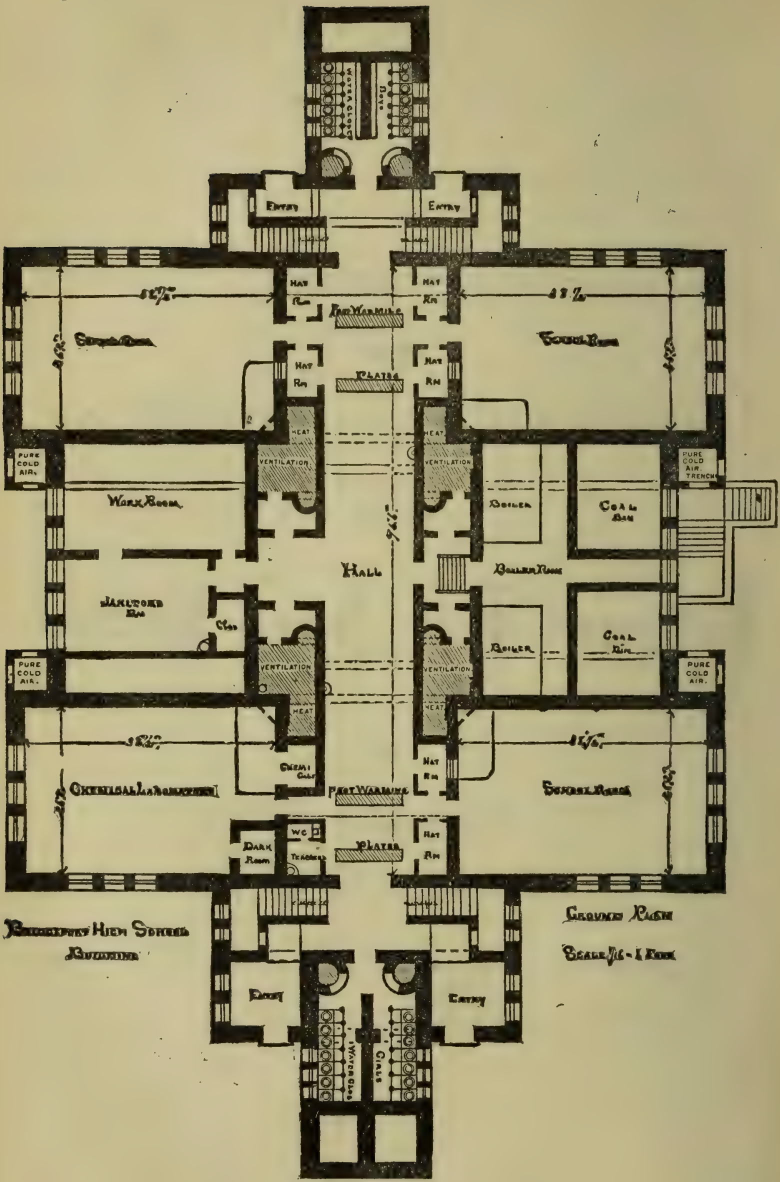
OF THE

Bridgeport High School Building.

BY

W. RICHARDS BRIGGS,

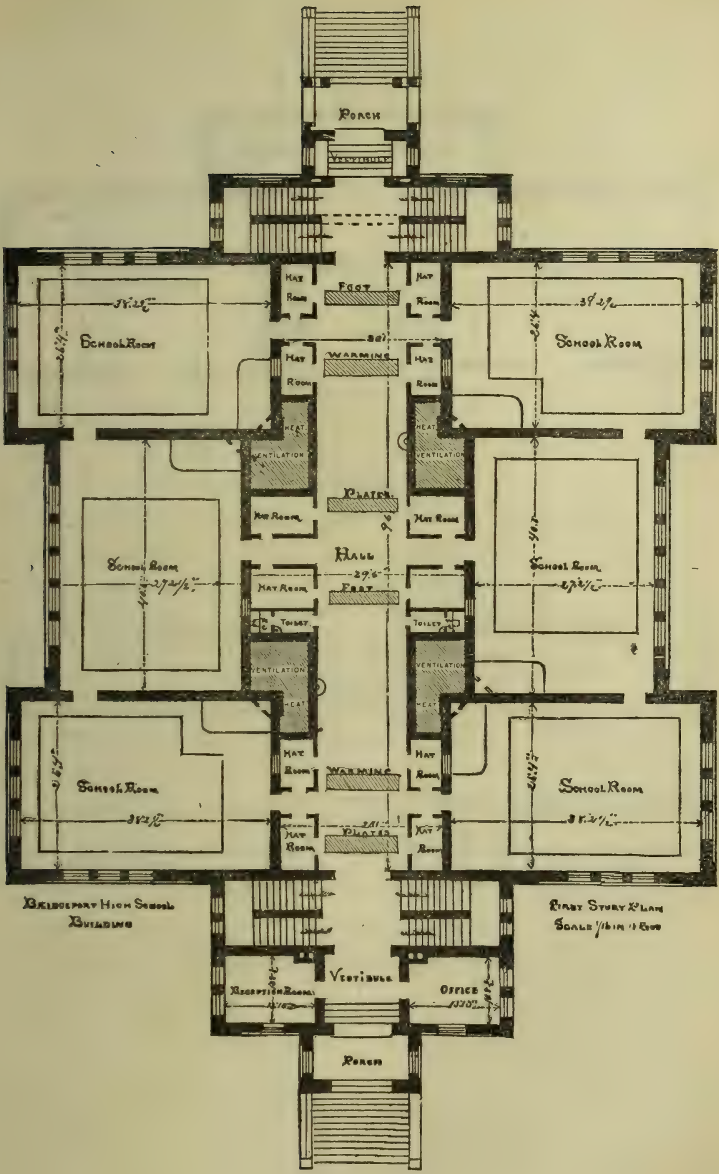
ARCHITECT, BRIGEPORT, CONN.

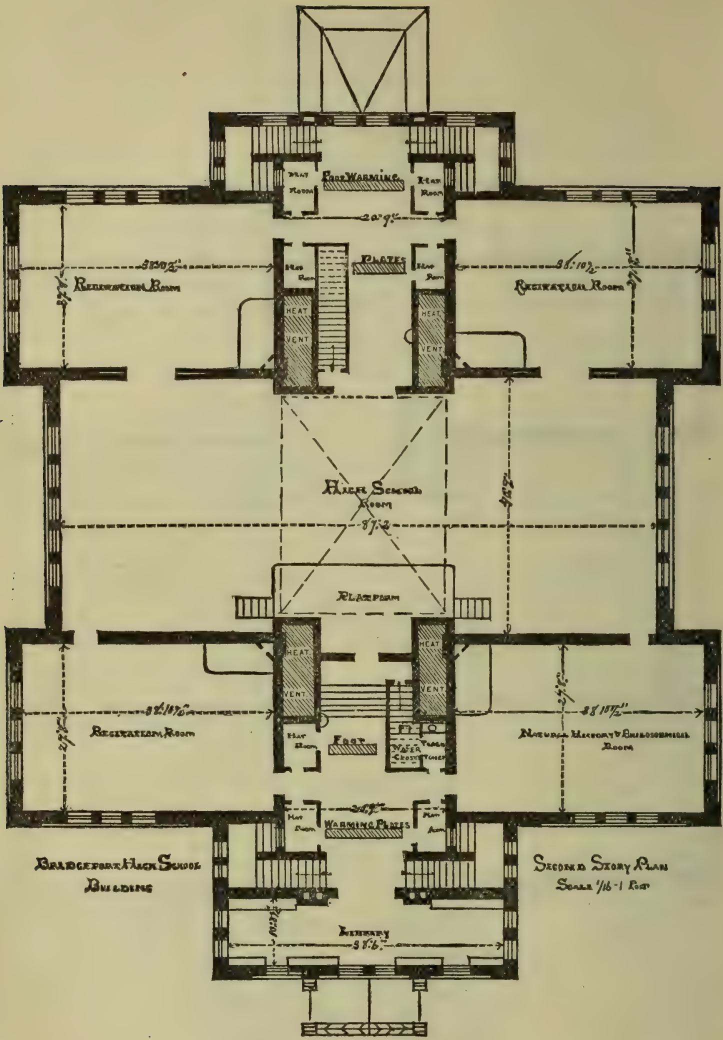


Bridgeport High School Building

Ground Plan

Scale 1/16 - 1 Foot


Porch
School Room
Hat Room
Foot
Warming
Heat
Ventilation
Plates
Hall
Toilet
Vestibule
Reception Room
Office
Bridgeport High School Building
First Story Plan



Bridgeport High School Building

Second Story Plan
Scale 1/16 - 1 Foot

THE HYGIENIC CONSTRUCTION

OF THE BRIDGEPORT HIGH SCHOOL BUILDING,

BY WARREN R. BRIGGS, ARCHITECT, BRIDGEPORT, CONN.

In no department of public or private works is there such vital necessity for a perfect system of hygiene as in the planning, construction, drainage, and ventilation of our school buildings. At no time in our lives are we so susceptible to disease as in our school-days. The rapid growth of the child, the mental strain that our forcing system of education requires, and the bad sanitary condition of many homes, all tend to weaken the constitution at this period, and render it particularly liable to the contraction of disease. The necessity of abating, as far as possible, and ultimately exterminating, what is known as preventable disease, has become of paramount importance. The alarming spread of malarial diseases and malignant epidemics among children in various parts of the country I attribute, in the majority of cases, to criminal carelessness in sanitary matters. Miserable construction, poor sewerage, bad plumbing, and no system of ventilation, combine to produce among the poor classes hot-beds for the nursing of the germs of pestilential disease, which are then conveyed by the children to our school-houses. Much has been accomplished by our State and local boards of health to remedy this evil, but there still remains a vast amount of work to be done. Stringent legislation is needed in all matters pertaining to building, and proper officers appointed by the Governor to see that the laws are enforced are required in all larger cities in the State; when this is done we may hope to see the erection of the miserable shams, that greedy speculators and unscrupulous landlords now burden us with, stopped. So long as they enjoy the license which the present laws allow them, we can hope for no improvement.

The school-house, where the child spends from four to six hours

each day, demands our direct attention. The majority of the pupils in our public schools come from the poorer classes, and are, as a rule, none too cleanly in their personal habits; coming from homes which have none of the luxuries and barely the necessities of life, they are in no condition to be subjected to either excessive heat or extreme cold. Foul air and poor ventilation they have in plenty at their homes, and we should endeavor in the school-room to supply them with pure air, uniform temperature, plenty of sunlight, cheerfulness, refinement, and comfort; our buildings should be so planned as to combine all of these requirements.

Dr. Lincoln, in his admirable paper recently published in *Buck's Hygiene*, has plainly told us what a school-building should be, and the writer has endeavored, as far as lay in his power, to produce a building that shall be a model of its kind. He has not only labored long and faithfully himself, but has consulted the leading experts of the country in regard to the heating, ventilation, and general sanitary arrangements of the building, and has always received from them their hearty approval, coupled with the remark: "We have frequently called the attention of the public, in our articles, to what a building should be, and we are glad to see at last a building planned in accordance with our views."

In all the writer's efforts he has been most ably seconded by the Board of Education of this city, and more especially by the members of the board who comprise the building committee. They are, to a man, whole-souled, enlightened, Christian gentlemen, who have the welfare of the public in view, and although they have been severely criticised and wrongfully assailed, they have unflinchingly put their shoulders to the wheel, and worked with a zeal that cannot be too highly commended to secure for the city a building that can be pointed to with pride, when finished.

The site of the new building is admirable: situated almost in the geographical center of the city, in one of its best localities, far removed from all noise, dust, or odors arising from factories, stables, or the like, being completely isolated on all sides, having no large buildings or trees to shadow it, and standing within a few feet of the highest ground within the city limits, it presents natural advantages that have never been surpassed, and seldom equalled. The lot has an actual elevation of 61.0″ above the average high-water in the harbor. It has a frontage on two streets of 200′, and an average depth of 256 feet, the lot running from street to street. Not only are great advantages obtained by this frontage, in ease

of access to the building, but thus are secured unexceptional facilities for the disposal of sewerage, there being a twelve-inch main running down the hill in the center of both streets; the fall of these streets is very rapid, being between four and six feet in every hundred.

The principal front (there is no rear) of the building faces Congress street, which, running nearly east and west, gives it a southwesterly exposure. This arrangement secures in every room in the building, during a portion of the day, *sunlight* in abundant quantities.

The building is designed to be constructed of brick, with local stone foundations and underpinnings, brown-stone caps, sills, and trimmings, exterior steps to be of granite, and roofs of slate. It will consist of three stories, viz., the ground-floor, first story, and second story. It contains a total of fourteen school and recitation-rooms, a chemical laboratory, reception-room, office, library, janitor's room, work and boiler-room, beside the water-closets.

The height of all rooms in the building, with the exception of the High School room, is 13.0″, the High School room having a height of 28.0″ in the center, and 21.0″ on the sides.

The writer does not consider it necessary to go into a detailed explanation of each floor-plan, but will simply call attention to some of the novel features and general construction of the building. The plans themselves illustrate sufficiently the general position and arrangement of rooms and halls.

The ground-floor is located two steps, or about fifteen inches, below the grade of the lot. This, under ordinary circumstances, would be considered an objection, on the plea of dampness, but the floor and side walls have been so carefully prepared that the rooms situated on this floor are expected to be the driest in the building.

In the first place, the ground itself is unusually free from dampness; ample provision has, however, been made for the removal of all surface-water by the introduction of six-inch drain pipes, laid with open joints, in trenches filled with loose stone, these stones covering the top of the pipe a few inches. These pipes run all around the building, just outside of the foundation wall, and are then carried to the manholes, where they are connected with the main sewer above the running-trap.

The ground under the floor of the school-rooms situated on the ground-floor is first cemented 2½ inches with the best Rosendale

cement, and then covered with two coats of asphaltum. This asphalt is put on hot, and not only covers the entire bottom, but runs up on all outside and inside walls to the height of the copings, and is then carried across the top of all interior and exterior walls, forming an impenetrable protection against dampness. Not only is the ground-floor and the walls to the height of the coping treated in this manner, but all outside walls in the building—they are all coated to their full height and width with two coats before they are furred. This I believe to be a more perfect safeguard against dampness than the common hollow wall.

STAIRCASES.

The staircases consist of four flights; two at either end of the building. While being convenient and easy of access from all parts of the building, they are yet sufficiently isolated to be free from the usual objection of noise, and are moreover absolutely fire-proof. They are constructed with iron treads and risers, securely fastened to string-pieces, also of iron, that are bolted directly to the brick enclosing-walls. The top surfaces of all treads are to be covered with rubber, to prevent slipping. All platforms and landings are to be formed of granite slabs 8″ thick. The stairs are formed with two "runs" for each flight, with landings midway, this being done to secure an easy ascent. The stairs are all 5′ 0″ wide; all landings 5′ 0″ × 11′ 0″, risers $7\frac{1}{2}$″, treads 11″; they are all well lighted at all points by ample windows placed on each landing. An iron hand-rail, bolted to the walls, runs around on all sides at a suitable height. There is no wood-finish of any kind, with the exception of door and window casings, in the staircase halls. The sidewalls are all of face-brick laid in black mortar with struck joints. These walls, when hard, are to be treated with a coat of liquid filler, and then varnished in two coats, thus forming a perfectly hard surface, not easily marred or soiled.

HAT AND CLOAK ROOMS.

In all our school-buildings of the present day, the hat and cloak rooms have been more or less objectionable, especially in wet weather. Children coming in with wet garments hang them in narrow rooms, poorly heated and lighted, and usually unventilated, where they are allowed to steam in a close and unwholesome atmosphere during the session, and at its close are put on by the child

in a worse condition than when taken off. An attempt has been made to remedy this evil in the construction of this building. In the main halls, which are spacious, and which are to be heated and ventilated in the same manner as the school-rooms, have been placed the hat and cloak rooms—two for each school-room. These rooms, instead of being lathed and plastered in the usual manner, are simply partitions of ash 8′ 0″ high, entirely open at the top, and so arranged, that only the supporting-posts run down to the floor. The portion of the partition between the posts is kept 4″ from the floor, giving a free circulation throughout these rooms. Damp or uncleanly clothing hung in these rooms during the session instead of being filled with the foulness arising from confined atmosphere will become purified by the constant circulation of pure air,—the impure air being disposed of through the main hall ventilators.

LIGHT.

All eminent writers on School Hygiene have called attention, and dwelt with much stress upon the importance of abundant light properly distributed in all our school-rooms. That the light should come from the left side and be introduced at nearly right angles to the floor-line is an established rule among those versed in school matters. Upon the actual amount of glass required by each pupil authorities differ. Dr. Lincoln states that the size of the windows, taken collectively, should equal at least one-sixth of the floor-space. Cohn, the German writer, requires one-fifth, or 30 inches to the foot. Some of the highest authorities require from 300 to 350 square inches of glass for each pupil; this coincides very nearly with Cohn, but Dr. Lincoln does not consider that, in our school-rooms that have a greater depth than those referred to by the above-mentioned authorities, the amount mentioned by them is enough.

In the Bridgeport school-house the window-stools have all been kept 4′ 0″ from the floor, and the window openings are carried up to within one foot of the ceilings. The size of the windows, taken collectively, equals, in the corner rooms, one-sixth of the floor-space, allowing 50 pupils per room, and gives 434 square inches of glass per pupil. In the middle rooms, the floor-space is seven times that of the glass surface, and, allowing 50 pupils per room, will give to each 403 square inches of glass. In the corner rooms the seats are so arranged that the light comes always from the back and left—in the middle rooms it comes only from the left.

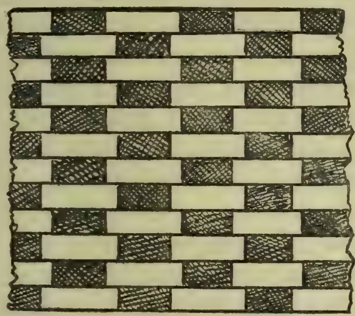
In the High School room, the glass surfaces, taken collectively, equal one-sixth the floor-space; allowing 200 pupils for this room, will give to each pupil 384 square inches of glass surface.

FLOOR, AND CUBIC FEET OF SPACE ALLOWED EACH PUPIL.

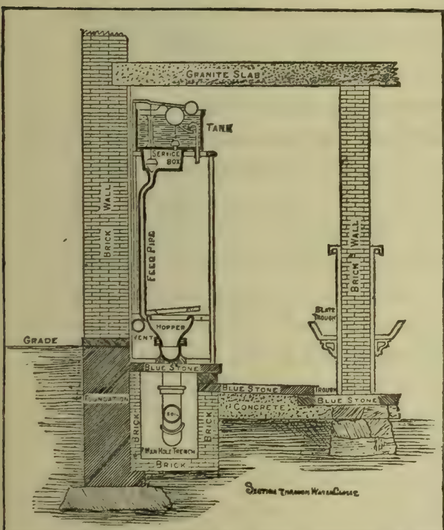
In the corner rooms, allowing 50 pupils per room, each pupil will have 20.50 square feet of floor-space, and 266 cubic feet of air. In the middle rooms each pupil will have 21 square feet of floor-space, and 273 cubic feet of air. In the High School, allowing 200 pupils, each pupil will have 17 square feet of space, and 441 cubic feet of air. While the floor-space in the High School room is somewhat smaller than the highest authorities require, the cubic contents are largely in excess of the most exacting, and it must be taken into consideration that this room is seldom occupied by the entire number of pupils for more than a few moments at a time, as the recitation-rooms used in connection with it are, during the school-session, in constant use. It should also be remembered that the number of pupils calculated for each room is their extreme capacity. It is to be hoped that no teacher will be burdened with more than 44 pupils, although I have based my calculations on a larger number.

THE WATER-CLOSETS AND THEIR CONSTRUCTION.

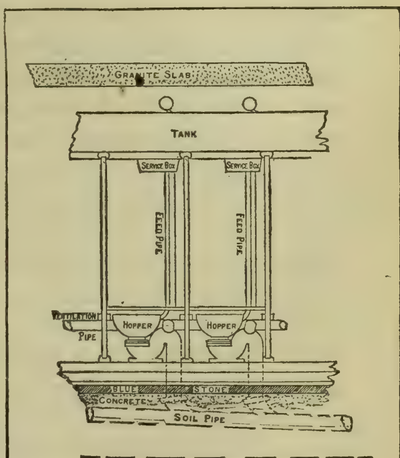
The demands of modern civilization require that we provide, either within our school-buildings or in close proximity to them, water-closets for the use of the pupils. There can be no doubt but that much harm is done to children, in many schools in our State, from the bad sewerage and careless arrangement of water-closets. It has been said that privies placed under the same roof which shelters the school should not exist, for a moment. I do not consider that this rule should be simply applied to privies, but that the groups of water-closets that are required in all our large schools should come under the same head; they should in no case be placed directly under school-rooms in the basement, as contamination will surely follow sooner or later. They should be, if not wholly, at least partially isolated from the building, and those for the boys removed as far as possible from those for the girls. The teachers' water-closets can, I think with safety, be placed in the building, that is if they are carefully ventilated; these water-closets will be used understandingly and are not liable to become unwholesome,



METHOD OF LAYING BRICK AROUND STOVES IN WATER CLOSETS



Section Through Water Closet



Elevation of a portion of the Closets

but the pupils' closets, even with the most careful watching, are liable to become foul from the habit so prevalent among children (I wish I could say that the habit was confined to children alone !) of making the closet a common receptacle for all kinds of garbage.

In the Bridgeport school-house, the closets for the pupils have been placed at either end of the building under the entrance steps, far removed from each other, securing a complete isolation of the sexes. They are also completely shut off from the main school-building by the intervening staircase halls; by this arrangement, ease of access is obtained, conbined with complete isolation, obviating the danger of contaminating the main school-building.

The water-closets have been constructed with a view to having as little wood-work as is possible with the requirements of comfort. The main-floor is to be of blue-stone flagging 4″ thick, laid in Portland cement; this is laid on a gentle incline to a certain point, to secure a good drip or wash from all points of the room. The side-walls are of brick, treated in the same manner as has been before mentioned in the description of the entrance-halls. The ceilings will be formed by the bottom of the granite slabs that are used for the floors of the vestibule, porch and outer halls. The casings, doors, and seats for the closets comprise the entire wood-work: these are of ash and are treated to a coat of filler and then varnished in two coats. The partition between each bowl is to be of slate $1\frac{1}{4}''$ thick, $7' 0''$ high by $2' 6''$ broad. These slate partitions are held in position by iron floor and wall-pieces and caps of the same material (see accompanying drawings). The floor upon which the closets stand is raised one step above the main floor of the closet (see drawing), and is also composed of blue-stone flagging 4″ thick, a hole being cut through this stone for the outlet of the closet. The closet that is intended to be used is the Hellyer Short Artizan Hopper. This closet combines more good points, in the writer's opinion, than any at present known to him. Its chief point of excellence is its simplicity of working, and the fact that it is entirely of earthen-ware. There are no pans, valves, or plungers to become foul or get out of order: it is, in fact, an earthern hopper of improved shape, fed by a continuous tank to which is attached for each bowl a serving-box. When the seat is occupied, by a simple device a valve is raised, and the serving-box filled with water from the tank, at the same time a small stream is permitted to trickle into the hopper, wetting the sides and preventing the adhesion of excretion to the bowl. When the seat is relieved of its

weight, the valve before referred to is closed, another one opened and the contents of the serving-box (some three gallons) suddenly discharged through a large pipe connected with the flushing rim into the bowl of the hopper, carrying all solid matter through the trap. As I have said before, these hoppers, both bowl and trap, are of white earthern-ware, they are to be securely bolted to the blue-stone and left entirely open and exposed to the view. The seat is supported by the slate partitions, on which are bolted slate cleats. The chain operating the service-box and the feed-pipe are both enclosed in an iron pipe, so as to be completely inaccessible to the pupils.

The tank and service-boxes are of iron, painted. Directly under the platform on which the hoppers sit, there is to be constructed a man-hole trench to be built of brick, coated with asphalt; the top is formed of the blue-stone that the hoppers rest upon. This man-hole is 2′ 0″ broad by 3′ 6″ high, and is large enough to permit of a man crawling through it to inspect the pipes. This trench is to have an iron register at one end for the admission of pure air, and at the other is connected directly with the ventilating-shaft. In this trench are to run the soil-pipes from the hoppers; these are to consist of 6″ cast-iron pipes with 4″ Y joints for each hopper. These pipes are caulked with molten lead and then covered with two coats of asphaltum to prevent rust. By the arrangement of this trench the soil-pipe and its connections are always accessible; even should a leak occur in any of its joints that was not at once discovered, the stench arising from such a cause would not enter the building but pass off through the ventilating-flue. The urinals are placed along the inside division walls; they are to be constructed with slate backs and troughs put together in the most approved manner, the trough being supported by brass brackets; the back is arranged with a neat cap of slate, under which is run a water-pipe perforated with small holes so as to secure the complete wetting of the entire back at all times. Underneath this trough, in the floor, there is another trough, the bottom and one side being of blue-stone and the other formed by the slate back; this trough has an inclined surface and is intended to carry off all drippings or slopping that may occur in or about the closets or urinals. At its outlet it is trapped with a deep running trap and then connected with the main drain. This arrangement will enable the janitor, at the close of each day's session, to thoroughly wash down with a hose the entire room.

Upon the inside walls of rooms that are occupied by these closets have been placed ventilating flues, two for each of the closets. These flues are of large size, and run up through the building, entirely independent of all other flues, to a point far above the main cornice-line. Through these flues the extension of the soil-pipes of each section of hoppers is carried, and there is also connected with these flues a vent-pipe, running under the seats just above the trap of each hopper. Lastly, the trench in which the soil-pipe runs is also cemented. The lower portions of the flues, that is, those parts of them that come directly in the rooms occupied by the water-closets, are enlarged into a circular form (see plans), this being done to permit of the introduction of a small stove in the bottom of each flue, and this stove is to be kept running ALWAYS, both winter and summer, as the writer believes that this is the ONLY WAY to secure a steady up-current at all times under the varying conditions of the atmosphere. The brick-work around these stoves is laid in open work (see sketch), and on the inside covered with wire netting. There is also an iron door provided for each flue. By this arrangement many points are gained: not only are the hoppers and soil-pipes perfectly ventilated, but any stench arising in the rooms is quickly removed by the strong up-current through the flues. Again, in the winter, these two stoves in each room will be ample for heating purposes, while in summer, by a simple device, the direct radiation is shut off from the room, and thrown entirely up the flue.

The teachers' water-closets, situated two on each floor, are to be of the same pattern as those described, fitted up in the same manner as the ordinary house-closets, but with special reference to their construction and ventilation.

NOTE.—The soil-pipes for the teachers' closets in the main building are laid in a trench in the same manner as described above; the main drain runs into a man-hole just outside of the building, where the three lines of soil-pipes (one from each section of hoppers, and one from the teachers' closets) are brought together just above a deep running-trap. This man-hole is covered with a blue-stone flag, is carefully ventilated, and easy of access. There is also connected, just above the trap in this man-hole, the rain-water drains connected with the leaders from roof, so as to secure during every rain a thorough scouring-out of all these drains and their connections.

The reader, by studying the accompanying plans and sketches,

will be enabled to readily understand the general arrangement and working of this system.

HEAT AND VENTILATION.

It is generally admitted, on all sides, that the most practical, economical, and surest way of heating our buildings, at the present day, is steam. Granting that steam is to be our medium, it next becomes a question of how it shall be used. There are, at this writing, two methods in general use, these being known respectively as the direct and indirect systems. The direct system means the placing of radiators or circulation-pipes in each and every room required to be heated. The indirect system consists in placing all the pipes or radiators in boxes in the basement. Pure, cold air is brought into these boxes, and by passing through the coils of heated steam-pipes is warmed to the degree required. The heat generated in these boxes is then conveyed to the various rooms through tubes or pipes, in the same way that heat is usually conducted from our ordinary hot-air furnaces. Both systems have many strong advocates, but as far as the writer's investigations and researches have led him, he has found, among men that have simply the heating of a room in view, the direct system in favor; but among those who have not only the actual heating, but the supplying of the room with fresh, pure air at all times, the indirect system is invariably adopted. From the personal investigations and practical experiments the writer has made from time to time, he is convinced that far better results can be obtained by this method than by any now known to him. It has therefore been adopted in the new building for this city. It may be said in objection to this system that the amount of fuel required to heat a given amount of space is largely in excess of that required by the direct plan; this is in a measure true, but not to the extent supposed. Again, it has been said that it is impossible to heat exposed rooms by the indirect plan, without an enormous apparatus. This also is a mistake, for neither is an extravagant use of fuel nor a gigantic apparatus required, if the apparatus is properly arranged and understandingly handled. The trouble has been not from the inability to produce heat, but from the extraordinary loss of heat, this being occasioned in many cases by the position of the introductory flues, and in other cases by that of the out-going ventilating-ducts. It should be our aim to utilize every

particle of heat entering the room before we allow it to escape; it is certainly folly to bring in vast quantities of pure, warmed air at the floor-level of a room, and send it out with equal rapidity at the ceiling-level, without having traversed the room, outside of an

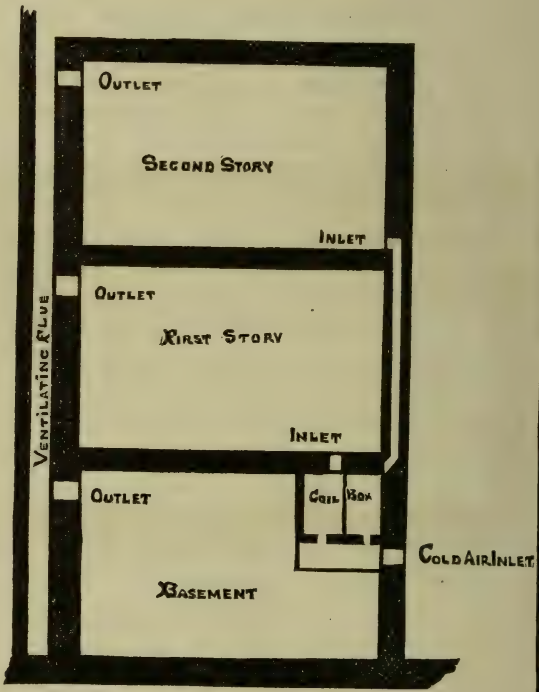


Fig. 1

almost direct line drawn from the incoming to the outgoing register; yet in many cases our registers are so arranged that it is impossible to get any different results.

I have before said that there is a general unity of opinion among experts as to the feasibility of indirect heating, but in regard to the placing of the heating surfaces in the cellar, and the position

of the incoming and outgoing registers, there is a wide diversity of opinion.

I shall endeavor briefly to describe some of the principal methods in common use, and the objections that I have to them, before describing the system adopted in the Bridgeport school-building: the placing of the coil-boxes in the basement, on the outer walls under the rooms to be heated (Fig. 1), and the introduction of the warmed air at the floor and its removal at the ceiling-level upon the opposite side of the room. The objections that I have to this system are:

FIG. 2

1. That in a building like the Bridgeport school there would have to be placed in the basement at least six separate coil-boxes for the generation of heat, arranged one under each room: that by placing these boxes in the basement-rooms the rooms are rendered entirely unfit for school purposes, and their utility for play-rooms greatly crippled.

2. That by placing these boxes far away from the center of the building, where the boilers are presumably located, a large amount of additional piping becomes necessary throughout the basement.

3. The boxes being placed on the outer walls of the building, there is danger of the pipes freezing; constant watching and attention is required to prevent this and to insure their proper working.

4. That the introduction-ducts or flues running up the outer exposed walls of the building lose a great deal of heat by their proximity to the cold; that this loss of heat cannot be wholly obviated even by the most expensive construction; that a large addition to the actually necessary heating surface is required to overcome the loss of heat caused by the exposed position of the flues.

Lastly: That the air entering upon the outer wall at the floor, and being removed on the inner wall at the ceiling-level, does not benefit the occupants of the room as it should. The action of the air as it enters is rapidly upward to the ceiling, where it stratifies, then along its surface to the outlet, as indicated in Fig. 2. The

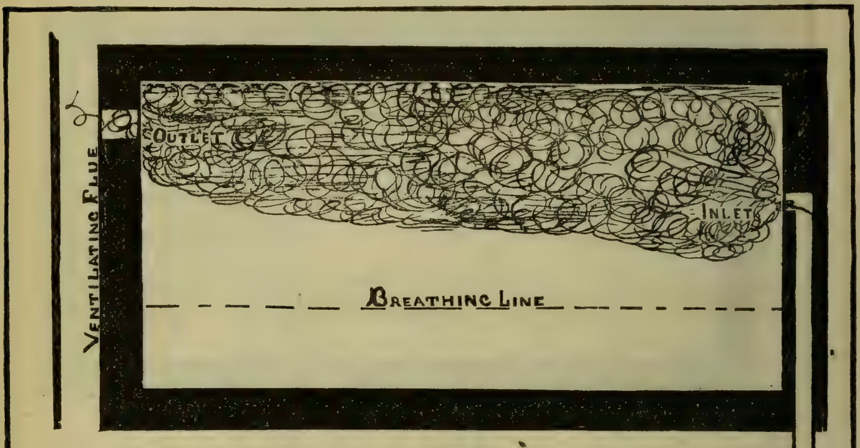


FIG 3

entering air is warm and light, and naturally rises and flows across the top of the room to the nearest outlet. The foul air of the room, being heavy with impurities, remains at the bottom, becoming constantly more contaminated. There is no doubt a certain amount of radiation or mixing is going on, but the great bulk of the pure warmed air entering the room takes the short cut across it and up the chimney, as shown in Fig. 2. This action of the warm air occasions, as may be readily seen, an enormous loss of heat, without accomplishing the very points aimed at, the utilization of every particle of heat before it is allowed to escape, and the thorough mixing of the pure incoming air with the air already in

the room. If any one doubts the correctness of the action of air as herein described, let him fill the incoming flue with smoke, that can be readily seen, and watch its course as it enters, flows upward

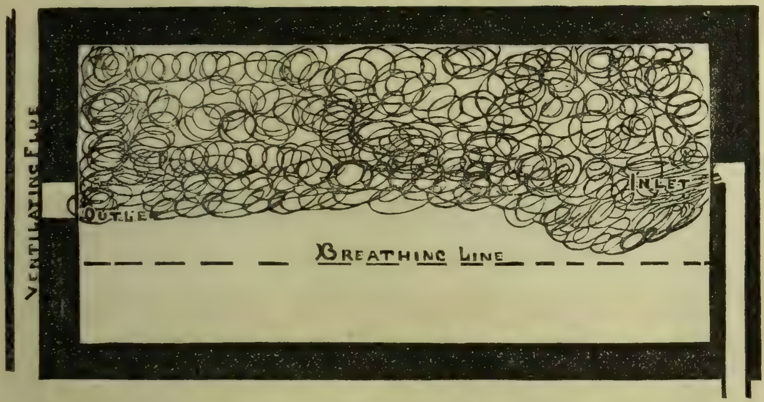


FIG 4

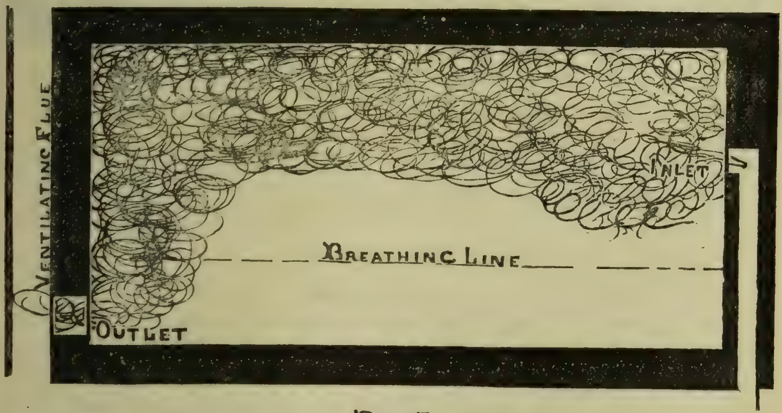


FIG 5

and outward, and see where the great mass of it goes. The dotted lines on this sketch indicate the breathing point of a person sitting.

It may be well to explain that in these experiments the outlets

have been at least *twice as large* as the inlets, and that there has always been heat in the outgoing flues to produce a strong up-current, as I believe this to be the *only* sure way to produce a constant outward flow of air. In Fig. 3, the outgoing flue is in the same position, but the incoming flue has been raised about two-thirds of the way towards the ceiling. In Fig. 4, the flues have been placed on about the same level, but with no better results. In Fig. 5, the outgoing flue has been placed at the floor with the results shown in the sketch. In Fig. 6, both flues are at the floor-level,

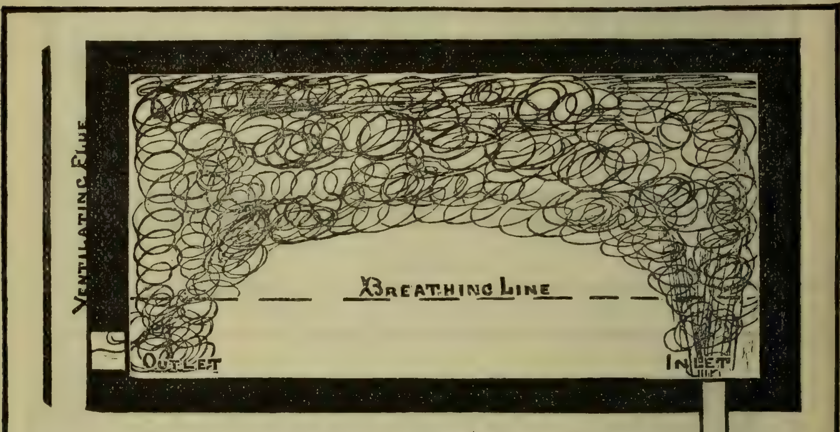


FIG. 6.

with better results than have yet been obtained, but still far from satisfactory. I have thus tried to show the general action of incoming and outgoing currents of air by the placing of the introduction-flues on the outer walls.

The second method in general use is the placing of the coil-boxes upon the inner wall, and the removal of the foul air at the opposite side of the rooms. I consider the placing of the coil-boxes on the inner wall, a great improvement on the other method, as by this plan they are centralized, extensive piping is saved, and the danger of freezing obviated. The placing of the exhaust-flues on the opposite side of the room I believe to be open to the same objections that I have described in the first method. The action of the hot air, from the points where it is introduced toward the various outlets, is the same as in the sketches already shown, and will be readily understood by the reader.

In the Bridgeport school the coil-boxes for the heating of the various rooms have all been placed in the main ventilating shafts in the center of the building, and the air conveyed from them through these shafts to the rooms by means of metal tubes. The air enters the inner corner of the room about eight feet from the floor, the corner being clipped (see plans) so as to form a flat surface for the register-opening; underneath the register the space is utilized for a closet for the use of the teacher. The outgoing flue has been placed directly under the platform, which is located

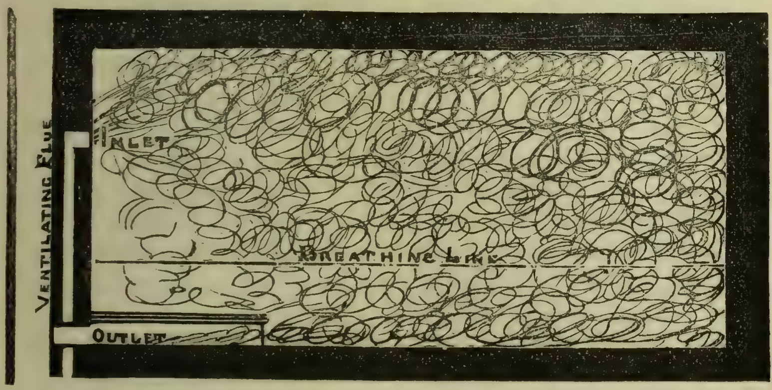


Fig 7

in the *same corner* as the introduction-flue. This platform measures $6' \times 12'$, and is supplied with casters, so that it can be moved at any time it is necessary to clean under it. Its entire lower edge is kept about 4″ from the floor, to give a full circulation under it at all points. The action of the incoming air is rapidly upward and outward, stratifying as it goes towards the cooler outer walls, thence flowing down their surfaces to the floor and back across the floor to the outgoing register. By this method all the air entering is made to traverse with a circular motion (see Fig. 7) the entire room, before it reaches the exhaust-shaft, and there is a constant movement and mixing of the air in all parts of the room. All the heat entering is utilized, and I believe that if the supply and exhaust-flues are properly balanced as to size, that there can be a very small loss of heat.

The inlets are all intended to be large, and the flow of air through them moderate and steady. The air is not intended to be heated to a very high temperature; the large quantity introduced is expected to keep the thermometer at about 68° at the breathing-level. The school-rooms contain on an average about 13,000 feet of air, or 260 cubic feet per pupil. It is proposed to supply each pupil with 30 cubic feet of air each minute, or 1,800 cubic feet per hour. Allowing 50 pupils to each room, this will necessitate the introduction of 90,000 cubic feet of air into the room each hour, and will change the air of the room 6.92 times within the hour, or once in about eight minutes. These calculations are based on a difference of 30° in the temperature.

In the exhaust-flues there are placed coils to produce a strong up-current at all times; heat is also obtained from radiation from the introduction-flues, which run through the foul air-shafts.

Trouble has always been found in regulating the supply of warmed air obtained by the indirect system, owing to the inability to control the heating surfaces. The usual way of constructing the apparatus has been to place in the coil-boxes sufficient steam-pipe to heat the room in the coldest weather. The pure, cold air passing over the pipes becomes heated to the desired temperature, and is then carried to the rooms; this answers very well during the coldest weather, but, as the weather moderates and less heat is required, the only way to regulate it has been to close the registers. This not only lowers the temperature of the room, but shuts off the supply of pure air entering. This fault has been remedied in the Bridgeport school-house as follows: The heating surface for each room is inclosed in separate cases or jackets (see Fig. 8) of metal, and are then subdivided into five sections, so arranged that any number of sections or the whole may be used at pleasure,—that is to say, that any one, two, or three parts may be used at discretion. In extreme cold weather the whole five sections are in use; in moderate weather two or three, and when a small amount of heat is required, only one. By this plan the supply of pure air remains always the same, but the degree to which it is heated is changed by the opening or closing of a valve. (See sketch.)

The arrangement of all the heating and ventilating apparatus in the center of the building renders it convenient and easy to manage, economical in its construction, and effective in working. The advantage is also obtained of having all speaking-tubes, call-

bells, and water-pipes run through the ventilating-shafts, where they are always accessible, as each shaft is provided with an iron

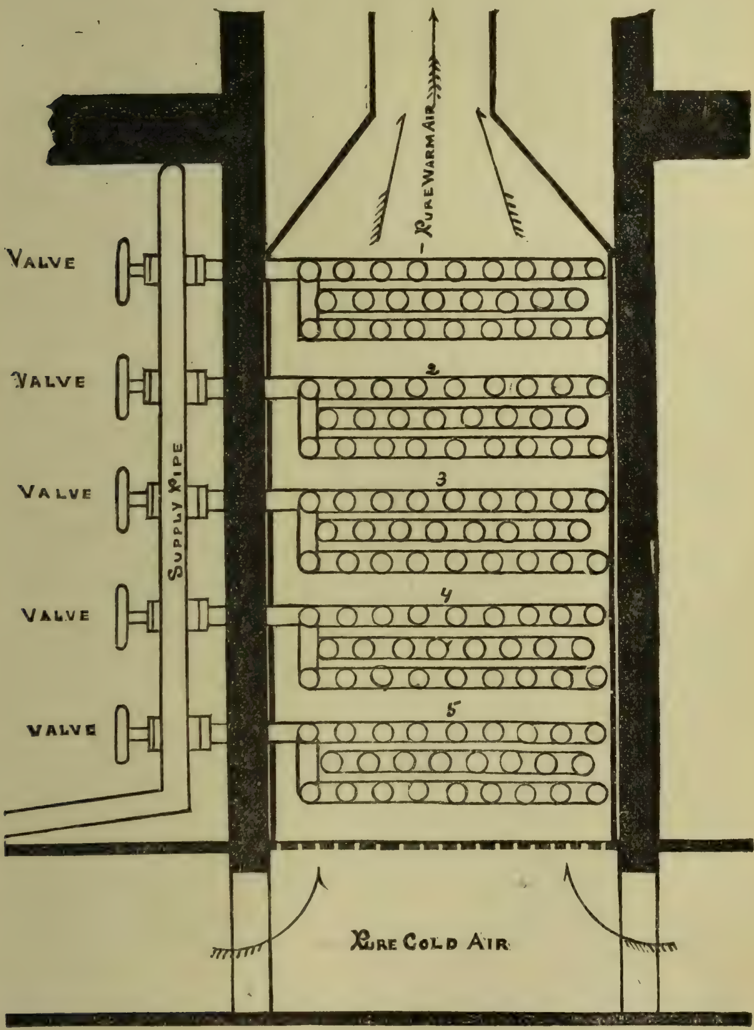


Fig 8

ladder. This system has not only been introduced into each room, but into the halls as well. There are placed, moreover, in the halls foot-warmers, that are indicated on the plans. These

warmers are simply steam-pipes encased in tin boxes arranged between the floor joists; the pipes are packed in sand to temper the heat, and are covered at the floor-level with checkered iron plates set flush with the floor. The tin cases referred to are water-tight and have a drip-pipe running down to the boiler-room, so that in case of a leak no damage may be done to the building.

The boiler-room floor is sunk some six feet below the level of the ground floor to insure a drip of all return-pipes from the coils. The cold-air inlets are on four sides of the building, the openings being about eight feet from the ground; these inlets are connected so that, whatever way the wind may be, a supply of pure cold air is always assured.

I have thus far spoken only of winter heating and ventilating; for summer ventilation I believe that there are no better inlets for the air than the windows. There are many devices that may be arranged in them that are simple and effective. It is not necessary to describe them here. The outlets, however, need a brief description; it is intended not only to use the outlet under the platform, but by a simple device the incoming register for warm air in winter is made to connect with the main outlet in summer, so that two outlets are provided during the warmer months. The upgoing current in the ventilating-shafts is maintained in summer, as well as in winter, by heat; there being placed at the bottom of each shaft a stove, which is to be used constantly when the boilers are not in use, insuring an equally strong up-current in winter as in summer.

I would say in conclusion that many interesting experiments have been made and important facts established. These experiments have principally been made with a model of about one-sixth the capacity of the school-rooms. They have always resulted most satisfactorily, and have proved to the writer the correctness of the principles herein advanced against the objections commonly raised that heat brought into the room on the inner walls will not sufficiently warm the outer walls. He would say that in every test yet made the registration of carefully graded thermometers has been from 1 to 2 degrees warmer near the outer wall than near the inner, showing conclusively that the flow of heated air is rapidly towards cool surfaces, and that if its volume is as it should be it will counteract the cold radiating from the outer walls and render the temperature of the air in their immediate vicinity comfortable. Many other interesting facts have

been learned, and much useful data obtained, but I have neither the time nor the space here to describe them. I have purposely omitted in this paper all figures not actually necessary, aiming to make it a simple statement of the writer's views, fortified by the results of actual experiments. If any should desire more minute details than are here given, by communicating with the writer he will willingly furnish all the information required, or should any be interested enough to come to this city, he will be pleased to go through with them some of the experiments.

The building has been described throughout as it was designed to be built by the architect; some modifications have been found necessary, however, on account of the meagerness of the appropriation.

PREVAILING METHODS

OF

SEWAGE DISPOSAL.

BY

PROF. C. A. LINDSLEY, M.D.,

MEDICAL DEPARTMENT YALE COLLEGE, DECEMBER, 1880.

PREVAILING METHODS OF SEWAGE DISPOSAL.

If it was required to express the foundation principle of true public hygiene in one word, that word would be Cleanliness.

Cleanliness in its broadest, fullest, and also in its minutest and most particular sense. Cleanliness and purity of food and drink. Cleanliness of person and apparel. Cleanliness all about us. Cleanliness and purity of the air we inhale, of the water we imbibe, and of the soil we live upon.

How to secure this degree of cleanliness, not for individuals only, but for whole communities, is the most important problem in public hygiene.

Civilization, with all its boasted advances, has not wholly solved it. Indeed many communities which complacently imagine themselves to be types of the most advanced civilization, are living amid hygienic surroundings far inferior to those enjoyed by the despised nomadic races, and dwellers in tents. The refinements of modern life as exemplified in the houses provided with all the "modern improvements," have introduced along with the luxurious conveniences, new and unexpected perils, to which our more simple ancestors were not exposed.

It is not my purpose to decry the benefits of civilization, but rather to suggest, that with every step supposed to be forward and in the line of progress, there is a liability to peril, which may compel retreat, or a change in the direction of advance. A familiar illustration may be found in a majority of our houses which are provided with kitchen sinks, fixed basins, water-closets, and bath-tubs, distributed among the rooms and connected by conduits with the sewers or cess-pools. I speak advisedly when I say that a majority of our houses so provided, would be more wholesome places to live in, if they had none of these "modern improvements."

If the tenants, like their grandsires, should carry by hand all their filth beyond the portals of their homes, instead of pouring it

into a system of circulating pipes, permeating the walls and underlying the floors, and constantly emitting noxious gases to pollute and poison the air, they would escape some dangers to which they are now exposed.

Real progress is slow, experimental, every step to be doubted, tested, and proved. There is still a great deal of science to be applied to the art of plumbing, before we can introduce with entire security into our dwellings a system of pipes for the circulation of fluid-filth throughout their walls and ceilings.

Filth, located, stationary, lodged, fixed, not in motion from us, is uncleanliness. All the conditions of life, whether civilized or savage, result in the production of more or less filth. The whole secret of cleanliness is to remove it, and to remove it speedily and at once; it always grows filthier by keeping. As a little leaven leavens the whole lump, so filth defiles and pollutes whatever is even near it.

There are two ways of accomplishing its practical removal. The first and most literal is by transporting it bodily to a safe distance; and the other is by putting it in such relations with other things, that its character as filth is destroyed through the operation of the laws of nature.

Both methods are susceptible of satisfactory results, if careful attention is given to the proper means of accomplishment. But in many thousands of the homes of Connecticut no attempt whatever is or ever has been made to secure hygienic cleanliness by either method.

And in thousands of other homes in the cities of our State, where public sewers have been constructed, the attempt to carry off the offensive refuse of living through their agency has proved a failure in a hygienic sense, because of a wide-spread ignorance of safe methods of using them.

The writer is not aware that any considerable number of householders in the Commonwealth of Connecticut have attempted any systematic methods of destruction of the filth of housekeeping, through the operation of natural laws.

In communities and in densely populated places—towns and cities, the satisfactory removal of filth to a safe distance is beyond the practicabilities of individual effort. It is not possible for the members of a family to carry away their daily product of filth to such distance that it will be safe not only as respects themselves, but safe, also, as respects all other inhabitants of the city in which

they live. Such results can only be reached by some public system of carriage, by which all the members of a community may be served. In no other way is it possible. The system which has been most frequently adopted in large cities is the sewerage system aided by the free use of water. Skillful engineering is competent to devise plans for any city in our state, by which all its streets can be sewered. Most of the cities in the state have constructed more or less of a system of sewerage, but none have yet completed it to an extent adequate to the wants of all its residents.

What, then, of those citizens of Connecticut who have not the advantages of public sewers? They are, for the most part, those who make no attempt whatever, either to remove or destroy the filth accumulating about their houses. On the contrary, they unhesitatingly and deliberately collect it, and store it away carefully as a permanent deposit in excavations in the ground close about their houses, and they designate their vile repositories privy-vaults and cesspools. The dangers of such practices I have sufficiently mentioned in a special paper published in the last annual Report, entitled "Sanitary and Unsanity Conditions of the Soil."

A few who are not connected with public sewers, and who, for the most part, do wiser than they know, (more particularly with their kitchen slops,) instead of having the abominable cesspool, distribute such refuse widely about their grounds. Where the space is ample, and the amount limited, if care is taken that it is not thrown too much in one place, this is doubtless one of the best ways for its disposal, because thus it is brought rapidly in contact with the purifying action of the atmosphere, and oxdized, and what fails of this effect is absorbed in the processes of vegetation, so that all the deleterious properties of such filth are speedily dissipated under the operation of the laws of nature.

There are, also, those who consume in their kitchen fires a portion of their refuse, which, so far as it goes, is a most effectual method of destruction, but the method is limited to combustibles, and cannot include wash-water and dish-water and other forms of dirty liquids, which are often the greatest sources of soil pollution.

There is a method of disposal which might be oftener adopted than it is. It was first suggested by the Rev. Henry Moule, the inventor of the earth closet. It is sometimes called the "absorption drain system," but better known as the "sub-surface irrigation system." The only requirements to make it adaptable to any house is a gradual decline from the house to the adjoining lawn or gar-

den. It is thus described by Waring:* "The house drainage is discharged into a tightly connected and thoroughly ventilated tank. Its outlet pipe starting from a point one foot below the surface of the water, and about two feet below the capstone, passes out near the surface of the ground, and is continued by a cemented vitrified pipe to a point about twenty-five feet further away. Here it connects with a system of open-jointed drain-tiles, consisting of one main, fifty feet long, and ten lateral drains, six feet apart, and each about twenty feet long—their drains underlie a part of the lawn, and are only about ten inches below the surface. The slope between the extremes of the system need not be more than fifteen inches.

Mr. Waring has had the system in successful operation at his house at Newport for several years, and it has not been interrupted by the severest frosts of a New England winter. He has improved the method by substituting Field's flush tank, by which he secured an intermittent discharge and more perfect flushing of the pipes, and also a wider diffusion of the sewage. There is doubtless a great advantage in the intermittent discharge by means of which the liquid suddenly saturates the soil, then gradually soaks away; the atmospheric air follows as the water subsides and oxidizes the more solid portions which the soil has filtered out. This copious intermittent discharge is every way better than the slow small trickling of dirty water.

Under circumstances favorable for the adoption of this plan it has proved reliable and effective. It is also capable of being greatly extended. The entire sewage of the village of Lenox, Mass., is thus disposed of in the most satisfactory manner.

HOUSE DRAINAGE BY THE PUBLIC SEWERS.

This is the method of filth disposal in which the people of Connecticut are largely interested; not only because it is already in partial operation in portions of many of the larger towns and cities of the State, but because it is expected to be the method upon which the citizens of large towns will depend in the future.

It is very desirable that every citizen whose house is connected with the public sewers, or who proposes to make connections, should have clear and definite ideas in regard (1st) to what he really seeks to do, and (2d) to the dangers he may be exposed to by doing it in a bad way.

* Waring's Sanitary Drainage, page 196.

He seeks by means of the sewers and an abundant water-supply to remove out of and away from his house all the excreta and refuse of housekeeping which is soluble or readily floated in water. In so far as he fails of this he fails of his purpose.

The sewer is in the street, a drain forms a branch from it to his house, and from this drain are given off branches of smaller pipes, permeating through the walls and ceilings of his house to the various sinks, basins, and water-closets. Thus is established an open continuous way from several places in the interior of his house to the public sewer in the street. As his house is higher than the sewer, it becomes a simple matter to pour the refuse of the laundry, the kitchen, the bed-rooms. and the water-closet into these open pipes, and, as it is all the way down hill, they soon flow into the common sewer to go on to the sea, mingled with like discharges from thousands of other households.

Why is not this a perfectly satisfactory removal of filth out of and away from his house? Let us enquire why.

By the commingling in the sewer of such immense quantities of matter in ever changing proportions and kinds, and in all stages of putrefaction, the sewer may be considered, in the language of the chemist, as a vast *test tube* of prodigious proportions, stretching its stupendous length beneath the surface of the highways and ramifying its branches into all our houses. The activities of the liquid filth poured into it are not merely those of motion passing down a declivity, but they are activities of a widely different nature. Silently, persistently, yet energetically and inevitably, the laws of chemical action are set in operation, and among the products of the changes resulting from the contact with each other of such various matters are the formation of noxious vapors, recognized under the general term of sewer gas. Now as sewer gas is lighter than common air it flows upwards as naturally as water flows downwards. The immediate consequence is that the pipes leading from the several apartments of the house described become the conduits by which the sewer gas is conducted directly into those apartments, and sewer gas is filth—often in the most dangerous form. And so our fellow citizen has failed of doing what he proposed, but instead has really provided admission for a far more dangerous form of filth than he had before, viz., the gaseous products of sewage putrefaction.

To many persons it will no doubt seem incredible that such conditions as above described should be tolerated for a single day.

But exactly such direct connections have been made and do still exist, namely, a simple open and continuous pipe from the interior of houses to the street sewer. In numerous other houses the only attempt at protection from the sewer gas is by a piece of bent pipe, which is called a trap, made to hold an inch or two of water, placed under the sinks and basins. This mode of protection is so unreliable as to be utterly worthless in most instances. A little pressure, to which it may at any time be subject, will force such a trap; it will often be emptied too by syphonage; and in other cases if left unused the water will evaporate. Yet in hundreds of houses in this State this trivial contrivance is the only guard against the free inflow of sewer gas. Thus it is quite evident that the sewers constructed for public use to afford to our citizens the means of removing out of and away from their houses the filth of housekeeping, may ignorantly be so used that, while they do secure a prompt and convenient removal of such filth, they do also inject, as it were, into the very midst of our homes a form of filth more dangerous than that removed, and so subtle and intangible that its presence is not even detected, and yet often so laden with the germs of disease that diphtheria, scarlet fever, typhoid fever, and other fatal maladies are the sure event to those who dwell in such air-poisoned houses.

Even while writing this I find in a daily paper the following:

"A HEAVILY STRICKEN HOME.

"New York, January 2, 1881. Mr. S. C. owns a handsome house at Montclair, N. J. The house is fitted up with all the modern conveniences and appliances supposed to insure the health of occupants. A short time ago one of Mr. C.'s children, a boy six years of age, was attacked with diphtheria and he died last Sunday. Wednesday another son, aged eight, died from the same disease. Friday night a little daughter also died from diphtheria. A third son is very low with the disease, and is not expected to live; and Mrs. C. has also been prostrated. The source of the disease has been traced to the ventilating pipes, which by a faulty arrangement *received the poisonous sewer gases and introduced them into the house.*"

In support of the doctrine of the dangers of exposure to sewer-gas, I quote the following from Bayliss, on House Drainage and Water Service:

"No fact rests upon a broader and more substantial basis of

truth than that the gaseous emanations from decomposing sewage, commonly called sewer gas, are a fruitful source of disease.

"Whatever the agency by which it works, we know that it comes with the power and potency of death; escaping into the free atmosphere, its deadly power is quickly destroyed by the oxidation of its organic poisons; but, when it mingles with the confined air of our unventilated living and sleeping rooms, it retains its deadly power long enough to do its work effectually.

"Dr. Mapother, of Dublin, an eminent authority, states that there occur annually in England 140,000 cases of typhoid fever, of which 20,000 terminate fatally, which are clearly traceable to defective drainage and sewer-gas poisoning; and yet typhoid fever is only one of a long list of prevalent zymotic diseases.

"If we look for the cause of the large mortality from zymotic diseases in our cities, we find it principally in sewer-gas poisoning. Other causes operate to swell the total, but to bad plumbing we may attribute the prevalence of pythogenic pneumonia, peritonitis, inflammatory rheumatism, typhoid and malarial fevers, croup, diphtheria, and many kindred diseases, which are almost epidemic in all our large cities."*

But the gases of putrefaction may be produced elsewhere than in the street sewers—aye, even within the walls of our own houses. The drain-pipes from our kitchen sinks and the bedroom basins are *little* sewers, and in a modern city house of average size these, with the soil pipes from the water-closet and the larger drain-pipe, into which they all enter in the cellar, present an aggregate superficial surface of many square feet. This surface is thickly and completely besmeared with deposits from the filthy fluids constantly passing over it. The gases generated here differ from those in the larger sewers of the street only in being more virulent from their greater concentration, because of less admixture with the common air. And these gases, made within the very walls of our houses, literally within the walls, are not stagnant, not motionless—they must move on to give place to constant new supplies; no trap can stop them. Unless special provision is made for their free passage to the open air without, more or less of them will surely find their way to the air within the house. This is emphatically true of those drains connecting kitchen sinks, water-closets, etc., with unventilated cesspools. As well might one try to trap the neck of a bottle, and then fill it with wine without displacing

* House Drainage and Water Service: Bayliss.

the air in the bottle. There is evidence enough that cesspools, as usually constructed, are always sources of great danger, and even under the most favorable conditions of construction, are worse than the sewers. It is equally evident that the use of public sewers, by connecting them with the interior of our houses, is a matter of such vital importance that the work can only be entrusted with safety to men skilled and trained in the principles and practice of that branch of Sanitary Engineering. Protection from these dangers can only be considered complete with the perfect exclusion of sewer-gas from the house air. No trap has yet been invented competent to secure this result unaided by other means. In addition to good trapping, it is equally necessary to provide for the ready and unobstructed escape of all the gases generated anywhere, in any of the channels or drains carrying filthy liquids. And such escape of gases should be further promoted, and the said gases diluted, by such construction and arrangement of pipes and drains that there shall be a constant and free circulation of outdoor air throughout the whole system of piping within the house. The winds of heaven should sweep freely through it from end to end, absolutely separated by mechanical obstruction from the interior atmosphere of the house.

The following directions for the proper drainage of a house are taken from the *Plumber and Sanitary Engineer*,* one of the most instructive and valuable journals in its specialty that is published.

"In the light of present knowledge, the following seem to us the essential requirements for the drainage of every house. Time and further experience may suggest other features, or modification of these.

"Every house drain should have an inlet for fresh air, entering at a point inside the main trap, and carried to a convenient location *out of doors*, not too near windows.

"A trap should be placed on every main drain to disconnect the house from the sewer or cesspool. In places liable to unusual pressure from the sewer, it should be a double trap, with vent from between the two traps running up full size above the roof; or where the pressure from sewer is only occasional, and the rigor of climate will permit, this vent may be carried to the sidewalk or area, at a safe distance from the windows. If the first trap is forced, the gas can gain easier exit through this pipe than through the second trap.

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* Plumber and Sanitary Engineer, Sept. 1, 1879.

"Every vertical soil or waste pipe should be extended at least full size through the roof. No traps should be placed at the foot of vertical soil pipes to impede circulation. Traps should be placed under all sinks, basins, baths, wash trays, water closets, etc., and as near these fixtures as practicable.

"All traps under fixtures, wherever practicable, should be separately ventilated, in order to guard against syphonage. Such vent pipes should not branch into a soil pipe below where any drainage enters it. In some cases it is preferable to carry it to outer air independently.

"Rain-water leaders should not be used as soil pipes, and when connected with house drains they should be made of cast iron in preference to galvanized sheet iron or tin, there being less liability of corrosion. Joints should be gas and water-tight, to preclude the possibility of drain air entering open windows.

"No safe waste should connect with any drain, but it should be carried down independently to a point where its discharge would indicate the existence of a leak or any overflow above.

"No waste from a refrigerator should be connected with a drain.

"Unless the water supply is ample, so that it will rise to every part of a building, ensuring at all times the proper flushing of fixtures and traps, a cistern should be provided into which the water will rise at night, or into which it may be pumped. Said cistern should be large enough to hold an ample daily supply, be kept clean, covered, and properly ventilated. The overflow pipe from it should *never* be run into any drain *under any circumstances.* The supply for drinking water should not be drawn from it, but from a direct supply, that is, direct from the street main.

"Water-closets should not be supplied directly from street pressure, or by a pipe from which branches are taken for drinking water.

"Where the valve closets are preferred to those that are supplied from a small cistern immediately over them, then the supply should be taken to a storage tank, from which it can be conveyed to the valves on the closets, thereby ensuring an equable pressure and securing more reliability in their working.

"All drain pipes within a house should be of metal in preference to stoneware, owing to the liability of the latter to crack, and the difficulty of keeping the joints tight. It is best to run them along the cellar wall or ceiling with a good incline. They should *never* be hidden under ground, as then leaks will not be perceptible. In some places it is common to paint pipes white, so that any leakage will show itself to the most careless observer.

"All drains should be kept at all times free from deposit, and if this cannot be effected without flushing, special flushing arrangements should be provided so as to effectually remove all foul matter from the house drains to the public sewers.

"All drains should be laid in a straight line, with proper falls, and should be carefully jointed and made water-tight. No right-angled junction should be allowed, except in the case of a drain discharging into a vertical shaft.

"No drain should be constructed so as to pass under a dwelling house, except where absolutely necessary; and then it should be constructed of cast iron pipes, with lead-caulked joints laid so as to be readily accessible for inspection and ventilation at each end.

"Whenever dampness of site exists it should be remedied by laying subsoil drains, which should not pass directly to the sewer, but should have a suitable break or disconnection.

"Water supply and drain-pipes should be concentrated as much as possible, and not scattered about a building. Horizontal pipes are objectionable.

"Plumbing fixtures should not be hidden behind walls and partitions, where their condition is never apparent. They ought properly to be open to view, and so situated that any leak would be readily detected.

"It is also well to have a plan of the plumbing of each house for the tenants' or owners' convenience and guidance in any emergency.

"In planning house drains they should be got outside the walls of the house as quickly as possible, so that there may be few joints of pipe, and the smallest chance of leakage from defects or accidents, taking proper precautions in locating to guard against freezing."

The foregoing requirements are practical, and the outcome of a long experience in overcoming the dangers involved in bringing into such intimate relations the interior of one's house with the interior of the great public sewers.

Now, in consideration of all the above, let us bring together a few propositions, and see to what conclusion they must lead us.

1st. The inevitable result of city life is the production of large amounts of refuse matter, commonly called sewage.

2d. The prompt and speedy removal of it is essential to the public health.

3d. Such removal by individual effort is impossible.

4th. Therefore, as a public undertaking, the sewers are provided for its removal.

5th. The use of these sewers by the people is always dangerous to health and life except certain precautions are carefully observed.

6th. The people are largely ignorant of these precautions.

Inference, reasonable and logical—Does not consistency demand that the authorities which have provided sewers to protect the people's health should also provide that said sewers shall not be a cause of danger to the people's health?

And yet there is no law in Connecticut forbidding our fellow citizens to commit suicide, and take the lives of their families, or prohibiting landlords from jeopardizing the lives of their tenants through exposure to the fatal influence of the public sewers.

It is a reproach to the intelligence of the civilization amidst which we live that some guard against this peril does not stand prominently upon the pages of our sanitary laws. If nothing be done by the authorized powers for the safety of those who are already in peril from their exposure to sewer gases, surely it is a species of crime to permit property owners through ignorance, or for any other reason, to go on unrestrainedly putting additional numbers of our fellow-citizens in danger by any further connections of houses with the sewers without adopting the safeguards necessary for their protection.

It it quite time something definite be done for public safety in this matter. While it may not be possible to prescribe a method of sewer connection which will always be devoid of danger, it is possible to prescribe certain safeguards which will greatly diminish these dangers, and, also, to prohibit certain methods of connecting, which are unquestionably often attended with serious and even fatal consequences.

Whether the necessary legislation upon this subject should be general or local is a mere question of expediency. The important fact is that the people need protection from perils to which they thoughtlessly and ignorantly expose themselves.

The whole subject of the safe disposal of sewage, and the risks to health and life attending some of the prevailing methods of disposal, is one of great and urgent importance. Public attention cannot be too soon or too strongly called to it. If the foregoing paper will contribute at all to this result it will accomplish the writer's purpose.

TRANSMISSION

OF

TUBERCULOSIS

FROM THE

MEAT AND MILK OF INFECTED ANIMALS.

BY

NOAH CRESSY, M.D., V.S., Ph.D.,
Hartford, Conn.

TRANSMISSION OF TUBERCULOSIS

FROM THE MEAT AND MILK OF INFECTED ANIMALS.

By NOAH CRESSY, M.D., V.S., Ph.D.

Nowhere in the struggle of life, against the manifold causes of disease, do we more effectually imperil our health and happiness than in partaking of animal food of a suspicious character. Hence the relation of man to the lower orders of animals, which has caused so much speculation among philosophers and naturalists on certain zoological affinities, is equally interesting and instructive in a *pathological* point of view. The skeletal framework and internal organization of the higher mammalia are not only morphologically indentical with the structure of man, and thus subserve the same purpose in animal economy; but the blood is similar in chemical composition, contains the same anatomical elements, and is subject to analogous changes in disease; hence the liability of transmitting to the human subject some virulent blood-poison, through the medium of our animal sustenance.

The highest achievement therefore in medical science is the requisite knowledge to point out such causes, rather than vaguely search the materia medica for a cure; and there is no theme connected with the science of dietetics more worthy of our daily consideration than the sanitary condition of the meat and milk that we consume. Though many inquiries have been made in this direction, and valuable conclusions reached, yet in this broad field. for scientific research, the accomplished laborers to day are few. But the hour has come when the sanitarian and physician, in response to a public demand, must join hands with the veterinary profession to explore certain realms in the causation of disease, and thus more accurately survey those boundary lines in pathology which now seem to separate the human maladies from those of our food-producing animals.

Consequently, there is no subject of more importance to the pub-

lic health, or better calculated to enhance the cause of sanitary science, than the practical study of this diseased meat question. The very *doubtful* condition of some of our home supplies already indicates the solution of certain vexed questions on the *possible* transmission of tuberculosis, which has long been a stumbling-block to the medical practitioner. The investigation of this subject therefore, in all its varied relations, is a work of vast importance, and one which the age now urgently demands in behalf of human welfare.

Hence it will require, for the achievement of these necessary results, not only the united efforts of professional and scientific men, but the influence of the public press, and the sanction of our state authorities. Then may we hope to see a thorough system of veterinary inspection established in this country that shall have full control of the public markets, and thus examine all suspicious animals before they are allowed to be slaughtered.

INFECTIOUS QUALITIES DEFINED.

The extent to which the different kinds of diseased meat are liable to be used, will depend in a great measure upon the comparative frequency that these infectious maladies occur in a given locality, and the more insidious the nature of the disease the greater the liability of its transmission from animals being slaughtered, that are more or less affected. Hence a brief allusion to the more common forms of infected meat, with a review of some of the pathological conditions involved, will best serve our present purpose, and possibly throw a gleam of sanitary light on this much neglected subject.

All meat, therefore, from whatever source or condition of animal it may come, that would cause sickness, disease, or death in man if partaken as food, must be regarded in the light of sanitary science as *diseased*, and consequently unfit for human use in any form. Accordingly, an article of meat possessing such qualities, must come from an animal afflicted with some form of an infectious malady, the germs of which are contained in the flesh, and are liable to be transmitted.

Hence a disease in which a contagious virus is developed during its course, or a virulent principle generated in the blood, renders the meat from all animals thus affected exceedingly dangerous as an article of food. But meat is not materially affected by the entozoic maladies of animals, unless the parasite in some stage of its

existence makes its abode in the flesh and has not been destroyed by cooking.

In accordance with this definition there are but few diseases that absolutely render these animal supplies perilous to human happiness. Prominent among these may be mentioned malignant anthrax, hydrophobia, tuberculosis, small-pox, and two parasitic affections caused by the trichina spiralis, and the measle tape worms. But the other maladies from which our slaughtered animals are liable to have suffered, may greatly impoverish the nutritive quality of the meat, and thus render it unpleasant in taste and general appearance; yet, if the flesh contains no animal poison or other morbid products, no harm can possibly come from its use when served upon our table. And even a diseased article, when thoroughly cooked, may not prove injurious to one whose digestive powers are active.

It is not an easy matter, therefore, in all cases to decide whether meat is possessed of injurious qualities or not, without a careful inquiry into the history of the article, or a microscopic inspection. Trichinous pork is an example of this kind; and of the many fatal cases on record, none of the victims ever suspected the meat until a peculiar form of sickness made its appearance, involving a number of individuals who were known tc have partaken of the same. This is also true of black-leg veal many times, and of other fine-looking specimens of meat that are affected with anthrax poison, which is liable to be transmitted.

Many varieties of diseased meat, however, are so palpable that even by the dexterity of the butcher's art it is impossible to disguise them. The tuberculous deposits upon the pleural membrane lining the chest cavity, thus causing the lungs to adhere to the ribs, or along the internal walls of the abdomen, are sufficient evidence to condemn the carcass. Measly pork and beef are also easily detected by the unaided eye; but the parasitic contamination of such meat is often overlooked, and consequently there is always an opportunity for a tape worm to become initiated in all who may partake of it.

TUBERCULOSIS INFECTIOUS.

As this disease is comparatively new to the veterinary profession, its clinical history and pathology has not received that attention which the subject now demands. In fact, few are aware to-day of the extent to which this insidious malady prevails, but the rapid strides

which it has made and the hold it has already gained on our stock, observes a well-known veterinary author, renders it one of the most important questions affecting the well-being of the bovine species.*

The *contagious* nature of tuberculosis, as shown by recent experiments on animals, can no longer be doubted, and it is now conceded by comparative pathologists that the bovine form of this disease is identical with that of man. Consequently there is great liability of its transmission, either by inoculation or ingestion. In fact, it has repeatedly been produced in rabbits, Guinea-pigs, and calves by feeding them with tuberculous matter. Prof. Gerlack of the Berlin Veterinary School claims,† as the result of his researches, that this disease in cattle is very infectious, that the presence of a specific virus is evident, and that even the flesh of such diseased animals under certain circumstances, and also the milk, possesses infective properties, though to a less degree than the cheesy matter from the lungs.

That tuberculosis is now rapidly on the increase no well-informed veterinarian can deny. It ranks among the few great scourges of the land; and though our losses, thus far, in live stock property have been largely due to other plagues which sweep their victims off in a summary manner, yet the ravages of this disease can only be realized, says Prof. Walley,‡ when we take into account the vast deterioration, the slow but certain decimation of many of our best herds, the destruction of our animal supplies, and also the danger to human life which can no longer be considered chimerical. Still there are many who from want of knowledge on the subject may even despise the pathological significance of this fell destroyer and thus ignore its deadly meaning; but when we see thousands of these tubercular deposits in a single slaughtered animal, we are forced to conclude that the use of such meat can in no way promote our healthfulness. Thus we have in every form of tubercle an implacable and destructive foe, and, in fact, there is no other morbid product known that is so *protean* in the number of functional derangements to which it may give rise in the animal economy.

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*The Four Bovine Scourges, with an Appendix on the Inspection of Meat, etc., by Thomas Walley, M. C. R. V. S., Principal of the Edinburg Royal Veterinary College, 1879.

†The Veterinarian, London, March Number, 1875.

‡Op. Cit, page 143.

HEREDITARY TRANSMISSION.

There is evidently a strong pre-disposition in neat stock for the production of tuberculosis, and cattle are far more frequently affected than other domestic animals. The temperament and physical confirmation undoubtedly contribute much to its development; for animals of a phlegmatic type, with an attenuated form, long limbs, and narrow chests are usually the first victims of the malady. Breeders should therefore strive to avoid the possibility of transmitting such diseased qualities. It is more frequent in cows than in oxen, and especially those kept in dairies for a length of time. Hence lactation is believed to be a predisposing cause. The condition also in which animals are kept is no small factor. The cold, damp sheds, the dark, underground stables, and other ill-ventilated abodes, as well as the character of the food, all conspire to rekindle those constitutional taints into morbid activity.

If we inquire further into the causes of the increased susceptibility to the infection, as seen more especially in our thorough-bred stock, we shall find that heredity and multiplied consanguinity play no menial part. Any physical weakness which the sire or dam may possess is liable to be transmitted to the immediate progeny, but if one generation escapes, the trouble may appear in the next, in accordance with the well-established principle of atavism. Diseased conditions are also inherited; and I believe that there is no predisposing cause which exercises such a potent influence in the production of tuberculosis as the pernicious system of in-and-in breeding. Thus from parent to offspring, from one generation to another, we often see the fatal tendency transmitted in unbroken succession, and the more complicated the relationship becomes, the greater is the virulence of the resulting products. In spite, therefore, of the many palpable examples of this broken law, some breeders still pursue, year by year, the suicidal policy of clinging to *one strain*, regardless of the impending consequences.

Hence this insidious and malignant malady, soon to be recognized as *the dreaded* scourge of our land, is now being disseminated in every direction through the consanguineous infection of our thorough-bred stock. And Prof. James Law, F. R. C. V. S., of Cornell University, in alluding to this subject, says, "That the *esteemed* qualities have been preserved, strengthened, and increased in this way there can be no doubt, but there can be just as *little* doubt that any inherited weakness or disease has been often trans-

mitted and even intensified. I could mention particular families in our highest-priced breeds in which *tuberculosis* has become a fixed character;" and further on he observes that "excessive weakness and stupidity of the young is another common result of in-breeding."*

CONTAGION BY CONTACT.

The observations of Dr. Grad, veterinary surgeon at Wasselonne, Alsace, on the spread of this disease by contaminated stalls, are very conclusive. On different occasions owners had informed him that they had lost several animals from consumption *in the same stall.* At first he did not attach much importance to the matter, but one day, when visiting the stables of an extensive farmer in Leinheim, he was informed that annually for the last five years one of the cattle had died of tuberculosis in a certain stall. The last one he had the opportunity of examining, which had been there but ten months, but had all the symptoms of the malady, greatly emaciated, and troubled with a cough. Dr. Grad's attention was strongly aroused at such a state of things, and to test the matter scientifically he was allowed to select an animal for an experiment. Accordingly he chose from another stable a three-year-old heifer, in calf, that was to all appearances perfectly healthy. She was bred on the farm, had never been unwell, never coughed, and none of her progenitors had ever been affected with phthisis. The cow remained quite well until after calving, when a slight cough appeared; but it increased in frequency, emaciation gradually set in, with all of the symptoms of tuberculosis, and in twelve months the creature was a mere shadow of her former self. The evidence therefore in support of this mode of infection Grad could no longer resist, as this was the sixth case that had occurred in this stall. Hence he very naturally inferred that the disease was probably transmitted by the ingestion of tuberculous matter expectorated by the cattle which had previously occupied the place.

The extension of the malady by cohabitation is therefore always liable to occur when animals are so arranged in the stable that the sick and healthy ones can get their heads together, or feed from the same manger. The hay may thus become contaminated, and the infection takes place through the digestive organs. The expired air also is not unfrequently so laden with virulent matter,

* Report of Am. Public Health Association, New York, 1875, vol. 2, page 250.

especially in the advanced stages, that it is not safe for another animal to inhale it. This mode of transmission, which was first suggested by Dr. Morgagni,* more than a hundred years ago, and has found many advocates among physicians and veterinarians, has now been confirmed by the experiments of Dr. Tappeiner of Meran, in causing animals to inhale the fine particles of tubercular matter from the air of a room in which the virus had been evaporated by a steam atomizer. Out of eleven puppies experimented on, ten showed well-marked miliary tubercle in both lungs on being killed within twenty-five to forty days—thus proving that this disease is contagious by the breath.

VILLEMIN'S INVESTIGATIONS.

In 1865 Prof. Villemin of the Val-de-grace Hospital, Paris, having conceived that human consumption in certain cases might be due to a specific virus introduced into the system, resorted to a series of experiments on animals to test the question. He was the first to demonstrate the contagiousness of tuberculosis by *inoculation.* Rabbits and Guinea-pigs were selected, and the material employed was from the human lung. Inoculations were made in various parts of the body, but the results were uniform and of a serious character. Many of the creatures died, others, lingering in a depressed state, were killed, when well-marked tubercular deposits were found in all, especially in the lungs, and with more or less infiltrations in the other organs, thus showing that the disease had been transmitted.

These results, which gave him so much renown as a pathologist, led him to experiment with tubercular matter from other animals. Desirous, therefore, of testing the nature of the disease in cattle, he inoculated a rabbit with matter from a cow. The animal became emaciated, and in six weeks was destroyed. Its lungs were filled with hard, tubercular masses, and some of them had taken on a cheesy aspect in the center. The other organs of the body were affected in a similar manner as those in the previous experiments. Hence he concludes that bovine phthisis is *identical* with that of man.

Dr. Villemin has likewise demonstrated that the tuberculous matter produced artificially by inoculation possesses the same power of transmissibility as when the malady arises spontaneously,

* See Fleming's able memoir on the history of these investigations in the 48th and 49th Vols. of *The Veterinarian.*

—thus proving conclusively that in tubercle resides a special, elaborated virus which does not lose its identity by several removes, no more than small-pox.

This view of the subject is corroborated by the pathological researches of Dr. Lionel Beale of London, the celebrated microscopist, who declares that tubercle is a minute particle of living matter, and if inoculated under favorable circumstances it is almost sure to grow, multiply, and produce other morbid cells like that from which it was derived. And furthermore, Villemin has always considered tuberculosis a *specific* malady, for he found that a very small wound and an inconsiderable quantity of matter used was a manifest proof that the intensity of the disease is independent of the *quantity* of the matter inoculated, and that the number and extent of the internal lesions have no relations to those at the seat of puncture. A disease, therefore, that can be transmitted from one animal to another by inoculation and thus an identical virus reproduced is, strictly speaking, *contagious.*

CHAUVEAU'S EXPERIMENTS.

Further and more convincing proof of the transmission of bovine tuberculosis has been furnished by Prof. Chauveau, of the Lyons Veterinary School, who for years has been experimentally studying the intimate pathology of the various contagia. The success of his researches has afforded some startling results pertaining to the use of diseased meat. The discovery, also, that certain rich virulent matter can infect as readily through the digestive organs as by any other channel has given him a world-wide reputation; and his well-designed experiments on cattle, which he instituted in 1868, have settled for ever among comparative pathologists the question of the virulency of tuberculosis.

He purchased four calves the 18th of September, from a locality where this disease was unknown, which, upon rigid examination, were found to be in fine, healthy condition. The next day he administered an ounce of tubercular matter from an old cow's lung, including the hard and soft varieties, prepared in the form of a drench and given in divided doses. The first one, a year old, began to lose condition in about a fortnight, the respirations were quickened, though the appetite remained unimpaired. On the 5th of October he gave this calf another dose, but of different and more recent matter, and within a week the symptoms of tuberculosis were apparent. Emaciation proceeded rapidly, the coat be.

came rough and staring, and the animal had occasional fits of coughing, especially after drinking.

The second calf, six months old, had on the fourth day a profuse and fetid diarrhœa, but of short duration, and the animal remained apparently healthy for three weeks. But the characteristic symptoms, as in the other case, soon appeared, with enlargement of the glands about the throat. The third one of the same age, having shown no signs of disease, was drenched again October 9th with another kind of matter, but this calf longest resisted the action of the virus, and not until the 25th was there any appreciable derangement of health; but from that time, however, the phenomena of tubercular infection ensued with amazing rapidity, and in a week the calf could scarcely be recognized.

At the close of the experiments, November 10th, the miserable aspect of the three infected creatures, when contrasted with the thriving condition of the fourth, left no doubt in the mind of even the casual observer as to the changes that had taken place. The post-mortem examinations revealed a perfect generalized form of tuberculosis, with the local lesion of the bowels, *tabes mesenterica*, shown in a marked degree, some of the glands being as large as a man's fist. The morbid deposits in the chest cavity, also, were none the less remarkable. The lungs were studded with crude tubercles, some forty in number, varying in size from a pea to a filbert. The bronchial glands were also involved, but the liver, spleen, and kidneys were not affected.

Thus, in the space of fifty-two days, we have three typical examples, nearly uniform in appearance, of the artificial production of this malignant malady through the digestive organs. In presence of these facts, therefore, I trust that all inquirers after the truth of this matter will be forced to conclude with our illustrious pathologist that the virulence and contagious properties of tuberculosis are now demonstrated beyond a doubt. And the fact that bovine animals have contracted this disease through the agency of the feed gives us an additional source of danger, for creatures confined in the same stable or pasture, and drinking from the same ponds or troughs, are constantly liable to swallow some of this virus in the mucous discharges from the nostrils of their affected comrades. In fact it is never safe to put another animal in the same stall where one has sickened and died of this complaint without thoroughly renovating the apartment. Nor would I allow an affected creature to mingle with the healthy stock about the yard.

DANGERS OF DISEASED MEAT.

The meat from cattle affected with tuberculosis is not unfrequently seen in American markets, especially in our larger cities, and even in country towns. Yet, owing to the lack of public appreciation of any sanitary police measures to control such traffic, little or no complaint is made when we are served with consumptive beef. Seven years ago, after repeated opportunities for observation on this subject, I called public attention to the prevalence of this malignant malady among our dairy stock, that I believed was not generally recognized; and I now affirm with renewed assurance, in a pathological point of view, that the *baneful* consequences to our health from the use of infected meat and milk are not surpassed in the whole catalogue of contagious affections.

Such infected meat, therefore, should not be used; for any organ or texture in which tubercle has been deposited, is surely a dangerous article of food. Much will depend, however, upon the severity of the case and *extent* of the morbid changes that have taken place. Thus, from what is known in relation to the pathology of this virulent malady, we should at once interdict the sale of consumptive beef and milk, especially in the advanced stages of the disease, when the glandular tissues have become involved.

The relation of bovine tuberculosis to public hygiene was probably first suggested by Prof. Chauveau, who thirteen years ago had already indicated the real source of danger from the use of consumptive beef and milk. But no one has done more to promulgate these investigations, or has contributed more to the advancement of sanitary science in this direction, than George Fleming, F. R. C. V. S., Veterinary Inspector to the British army, and the accomplished editor of the London *Veterinary Journal*, who, by his encyclopædic writings, is an acknowledged authority on the subject. Thus, in a recent editorial, he says, "That the tuberculosis of cattle is a *transmissible* disease, and can be conveyed not only to animals of the same but also to those of other species in various ways, is now an *established fact*, upon the recognition of which we have for many years insisted; and, since we first called attention to it, some of the best pathologists in Europe have furnished additional testimony as to the readiness with which this transmission takes place, not only by *inoculation* or *ingestion*, but also, it would appear, by *cohabitation* of diseased with healthy animals.*

* *Veterinary Journal*, December, 1879.

Two years ago Prof. Colin of the Albert Veterinary College, contributed a series of observations on the *communicability* of tuberculosis, which were very conclusive, and threw a flood of light on this important sanitary question in relation to diseased meat. Several prominent German and Italian authorities have also published their clinical experience in this direction; and lastly we have the celebrated Professor Orth of Gottingen, furnishing the results of his researches and experiments. All of these are only confirmatory, however, of what has now been stated, but this confirmation is not without its value, especially in this emergency, when public opinion needs educating on the sanitary conditions of our meat supplies.

In his experiments, fifteen animals were fed with tuberculous matter from a diseased cow, and nine of those were infected, of which four died. The remaining five, becoming extremely emaciated, were killed. On examination nearly all the organs of the body were found involved in tuberculosis. In all the lungs were affected, but the serous and mucous membranes, the lymphatic glands, the liver, spleen, kidneys, and omentum were infected in different degrees. Consequently, the transmissibility of this affection to animals being proved, he insists that its transmission to man is possible, and has undoubtedly many times taken place.

TUBERCULOUS MILK.

The recent investigations of Prof. Otto Bollinger of the University of Munich, on the artificial production of tuberculosis as induced by the consumption of diseased milk, has thrown additional light on the subject. He claims that the milk of such animals has a pre-eminently *contagious* influence, and reproduces the disease in other animals experimented on from that point of view. He believes also that such milk, even when *boiled*, still retains its injurious properties. Further, he maintains that beyond doubt the tuberculosis of the human subject, though not completely identical with that of the cow, is yet strictly analogous to it, and that consequently the *wide prevalence* of tuberculosis in the native herds, at least 5 per cent. of which are affected, is a standing danger to health of the community.

Seeing the enormous mortality from consumption, more especially in towns, Prof. Bollinger believes it to be of the utmost importance to urge upon all classes, and particularly upon *farmers*, the absolute necessity of taking every possible means of *stamping*

out the disease among cattle. Meanwhile some measure of safety may be secured by the rigid exclusion of all *diseased stock* from town dairies, a measure which forms a prominent feature in the programme of the recently-established Associated Dairy at Munich, where all the cows are constantly kept under skilled veterinary surveillance, and any that may exhibit the least symptom of tuberculosis are at once weeded out.*

There is every reason, therefore, says Fleming, to *prohibit* the use of milk from cows affected with tuberculosis, and especially for *infants*, who mainly rely upon this fluid for their sustenance, and whose powers of absorption are very active. Even if it did not possess infective properties, its deficiency in nitrogenous elements, fat and sugar, and the increased proportion of earthy salts, would alone render it an objectionable article of diet. In fact, it has long been known that it was liable to produce diarrhea and debility in infants; but though many children fed on such milk have died from tuberculosis or a localized type of it in the bowels known as *Tabes mesenterica*, the part probably played by this liquid in its production has rarely been suspected.

He further observes, also, that, as the commencement of phthisis is generally so insidious in the human species, it is most difficult to arrive with any degree of certainty at the causes which directly induce or favor its development; but, from the evidence before us, it is to be feared that at least one of its sources must be referred to the utilization of the *carcass*, but more especially of the *milk*, of phthisical cattle as food. It is certain that tuberculosis is not uncommon and that it is a destructive disease among *dairy* cattle especially, and more particularly those in towns; that the udder of these animals is one of the glands not *unfrequently* involved; that infants and adults consume milk in somewhat large quantities,—and that phthisis is a very prevalent and fatal malady in the human species, and chiefly among the dwellers in towns and cities.†

Dr. Bromley of Lancaster, England, found characteristic tubercular lesion in the pulmonary organs of two pigs, which had been fed with milk of a consumptive cow; while the mother of the pigs, on being slaughtered, exhibited no signs of the disease. And therefore the pigs could not have contracted it by any hereditary influence, but the morbid virus was taken in with the milk.

* *Veterinary Journal*, February, 1880. † From *The Veterinarian*, vol. 48, p. 202.

Hence the necessity of guarding ourselves against such a diseased article of food.

Prof. Gerlach, Dr. Toussaint, and many other veterinary pathologists, have now demonstrated, by hundreds of positive experiments, that this milk is *infectious*, and contains a *specific* virus that can be transmitted from one species of animal to another, and from animal to man,* thus proving the *identity* of this dreaded bovine malady with that in the human subject.

SANITARY REGULATIONS.

The increase and sudden invasions of disease among our stock of late years should awaken new zeal in every farmer, and admonish the whole people of the necessity of having a vigilant inspector in every State, and authorized to act in every emergency. His decision, as a pathologist, should be *final* under all existing circumstances. The public must first be served. Its demands are absolute, and in the well-being of the greatest number the rights of individuals should never interfere. The want of such a sanitary organization has cost this country thousands of dollars on various occasions; and so long as our coast is allowed to remain exposed to the commerce of the world, without a veterinary surgeon at every port, it is purely a matter of chance whether or not we suffer from the malignant diseases of other lands.

Great Britain, after severe and repeated losses of her blooded stock, has seen the necessity of the adoption of such a sanitary measure for home protection. She has accordingly appointed professional inspectors at all the principal commercial points in her vast domain; and very recently, several important stations for pathological observations have been created by the British government. This was a noble move, and in the right direction; and we hope that other nations will follow her illustrious example in behalf of sanitary science. In fact, we need such encouragement everywhere. The general government should at once inaugurate and maintain similar positions in this country.

But we need not search in foreign lands to find a field for veterinary work that is unexplored. We have in the very midst of us

* The fact, as shown by Fox and others recently, that but 25 per cent. of the cases of consumption in man are due to hereditary transmission, while the other 75 per cent. are caused by unsanitary influences, gives increased interest and importance to all other methods by which tuberculosis may be caused. The origin of more or less of this large percentage is doubtless due to infection from milk or meat.—C. W. C.

a malignant disease among the cattle that is publicly almost unknown; and I fear that but few are aware of the increasing prevalence of tuberculosis in our milch cows. The nature of this malady is not well understood by the farmer, nor very much feared, though practically known as consumption. The cow that coughs, grows poor by degrees, even on the best feed, and at last fails in her milk, is frequently turned over to the butcher as the last resort. It is rare that an animal in this country is financially lost from this complaint. Some meat-vender will pick up these creatures at any stage of the disease for slaughter, and thus send the flesh to market; and as cheap lean meat is always in demand among the poorer classes, it is readily disposed of without complaint, whatever may be the ultimate effect of such a diet.

In fact, the traffic in diseased animals has now become so extensive that the State ought to control this matter by more active legislation. The public health has become involved, and the importance of a veterinary inspector, to thus protect our lives and health against the invasion of disease from this source can no longer be questioned. My attention has been called to this subject many times within the last few years, and recently even beyond the borders of this State. Hence, I have felt it my duty to thus publicly warn our people against the baneful practice of consuming the meat and milk of tuberculous animals.

The wide prevalence of this disease among our native herds and thoroughbred stock calls for immediate sanitary regulations throughout the country. Our infant population, and even adults, who are already rendered more or less infirm by their unhealthy surroundings and neglect of domestic hygiene, are now rapidly falling victims to this infectious malady, especially in our larger cities, as statistics show. Hence, in a moral point of view, this extensive invalid class should be protected. The subject, therefore, now demands the vigilant attention of our public authorities and of every sanitarian in the land.

In the absence of statistics, it will be impossible at the present time to estimate with any degree of accuracy the enormous extent to which this disease prevails among our dairy stock. But, if our calculations can be based upon the inspectors' reports in Italy, Bavaria, and other German states, we must conclude that *five* per cent. at least of our bovine animals are now affected, and with every facility for its rapid increase. Prof. Law, from his extensive observations, claims that in certain districts *thirty* per cent. of the

cattle suffer from tuberculosis, and with many high-priced herds this scourge yearly claims its victims.

In fact, Prof. Gerlach, in his experimental researches, was obliged to utterly discard certain strains of thoroughbred swine on account of the astonishing frequency of this disease among them. The sanitary supervision of this affection, therefore, will call for candid consideration and the deliberation of our most enlightened minds and professional experts, to devise and enforce such measures as will protect our tables, control this traffic, and stamp out the disease.

COLOR BLINDNESS:

BY

W. T. BACON, A.M., M.D.,

EXAMINING OPHTHALMIC SURGEON.

COLOR-BLINDNESS.

This defect in the visual power was for a long time denominated Daltonism, from a gentleman of that name, a victim of imperfect color perception, and one of the first to experiment on himself. This name is still used for imperfect color perception in some parts of Europe, but it is better known here as color-blindness. From the writings of Homer, some have thought that he might have been color-blind, and there is no reason for not supposing that this defect in sight has existed from the earliest times. About 1777, a shoemaker, by the name of Harris, called attention to color-blindness by stories of his own peculiarities in not distinguishing colors in the same way as other people. He says, that at the early age of four his suspicions were first awakened by picking up a stocking in the street, and carrying it to a neighbor who called it red, while he did not understand why that appellation was given it; it being sufficiently described to him by the name of stocking. While still young, he found that cherries on a tree were seen by other children, as of a different color from the leaves; while to him they only appeared of another shape. He is said to have been unable to name any color, but distinguished white from black, dark colors seeming to him black, but did not confuse light colors with black. Two of his brothers were similarly affected, while two other brothers and sisters enjoyed good color-perception. In 1790, an English chemist, by the name of Dalton, began the study of botany, and soon his expressions in regard to the color of flowers called the attention of his friends to his defective color-perception. A few years later he wrote on the subject: "It was not until I had pursued the study of botany for some time that I accidentally became convinced of a peculiarity in my vision. I was examining the pink geranium flower by candle-light, when it appeared to me what I called red, although by day-light it seemed an almost exact sky-blue. Friends, when asked, assured me that there was no great change in the color, by whatever light observed."

He further says: "I found most persons distinguish six colors in the solar image, namely, red, yellow, orange, green, blue, purple. To me it is quite otherwise. I see only two, or at the most three distinctions. These I call yellow, blue, and purple. My yellow comprehends red, orange-yellow, and green, of others, and my blue and purple coincides with theirs. Red appears to me little more than a shade, or defect of light. The difference between the green part and the blue part is very striking to my eye." A dark green cloth seemed to him of a muddy red color, darker than the grass. He matched red with green, and pink with green. In 1816 and 1818, two cases are reported by Dr. Nicholl, one a boy color-blind, and the other a man in middle life. The latter was unable to distinguish green from red, but could tell scarlet. Light yellow he recognized, but dark yellow was confounded with brown, though he could generally tell them from red. With the mistakes of the color-blind we might fill a volume, but a few of them may be of interest. There is a story of Dalton, many times published, but it is still valuable for illustration. He was a Quaker, and as a member of this sect opposed to wearing bright colors; still this modest and simple man, after having received a scarlet doctor's gown at Oxford, wore it in the streets several times, totally unconscious that he was not wearing the prescribed drab. Nearly all the color-blind that I have questioned on the subject say that they distinguish with difficulty strawberries on the vine from the leaves, or cherries on a tree. On one occasion, while examining railroad employés, I happened to be wearing dark red stockings, and while testing a color-blind person, after trying him on various colored objects in the room, asked him to name that of my stockings. He promptly replied, green. Another similar incident was narrated to me, namely, that a gentleman quite a number of years ago, when silk stockings and garters were worn, having lost one of a pair of red ones, went to a store to replace it, and returned with one red and one green. It was with difficulty that his friends persuaded him that he had not purchased a perfect match. It was not until 1837 that any attempt was made to divide the color-blind into classes. This was done by Prof. Seebeck, who permitted the examined to make their own comparisons, by allowing them to put together, from a number of colored objects, such as appeared to them of the same color. He used for the purpose a large number of pieces of variously colored paper, or glass. From his examination he made the following deduction, that there was a class who were

most insensible to the perception of red, also its complementary color-green, from the fact that they could distinguish them but little from gray, also from blue, which was confounded with gray. These distinguished yellow the best, but confounded light orange and pure yellow, deep orange, light yellowish, or brownish green, and yellowish brown, from light green, grayish brown, and flesh color, rose-red, green, rather bluish than yellowish, and gray, carmine, dark green, bluish green, lilac, and bluish gray, sky-blue, grayish blue, and grayish lilac. Another class he found quite like the first, in that they saw yellow best, red better, blue rather less than colorless, but especially confounded red and blue. The colors they confound are clear orange, brownish yellow, greenish yellow, and pure yellow, sealing wax red, rusty brown, and dark olive green; cinnabar-red and dark brown, dark carmine-red and dark bluish green; impure rose and pure gray; rose red; lilac, sky-blue and gray. He also first showed that there were degrees of color-blindness, the same as there were degrees in amount of vision for objects. Szokalski distinguishes five classes: those whose perception of colors is almost completely wanting; those who see yellow; those who also distinguish blue and red with yellow; those who do not perceive red; and finally, all those recognizing colors in a feeble manner, not being able to distinguish the mixture of two colors, but only seeing one of them.

There are two prominent theories in regard to color-blindness, viz.: that called the Young-Helmholtz, and the Herring, which we will briefly state. According to the first, there are three separate nerve-fibres, corresponding to these so-called fundamental colors, red, green, and violet. The sum of all the sensations which the eye is capable of receiving through these nerves is white, the absence of all sensation is black. But, while the fibre devoted to red is affected most strongly by red, it is, also, in less degree affected by green, and very feebly by violet. The green fibre may be affected in the same way by red and violet, more by the former than the latter, while the violet, though acted on principally by that color, is stimulated in less degree by green, and fully by red. All these colors are produced by a combination of these sensations, differing according to the proportions with which they are mixed. This theory recognizes three forms of color-blindness, according to the particular color-fibre lacking functional activity, viz., red, violet, and green blindness.

When a lot of wools, containing all shades of every color, is

shown a color-blind person, and he is told to choose from these all that appear the same color to him (lighter or darker), as the magenta sample, if he selects violets and blues he is red-blind ; if green and medium grays he is green-blind ; if red, purples, and oranges he is violet-blind.

Herring assumes four fundamental sensations, namely, blue, yellow, red, and green. These result from two sources of sensation, each being capable of a double or reversible mode of excitation, thus producing the sensation of color complementary to each other. One source of sensation corresponds to blue and yellow, the blue ray exciting it in one direction, the yellow in the other. The other source corresponds to red and green in like manner. Normal-eyed persons possess both sources of sensation, while the color-blind have only one, namely, that corresponding to blue and yellow, leaving them blind to both green and red and all the compounds. We come now to the consideration of what the color-blind really see, and this is best learned from the testimony of one of them, namely, William Pole, who has studied the subject in himself and gives us his results. He says: "When thirty years old my attention was called to the nature of my color-perception, and I found that this defect was uniform to all color-blind persons. The color-blind have only two sensations, one excited by rays called by the world yellow, the other blue, hence all concur in giving these names to these respective colors. But their powers of vision do not end here ; they have a vast number of sensations differing from pure yellow and blue. In some cases yellow is intense and full, as in the buttercup, at other times pale, as in the primrose; so blue, as in ultra marine, again weak, as in the sky. White and black appear just as to the normal-eyed. The color-blind is capable of appreciating the intense varieties of shade caused by the mixture of white and black. The colors cannot be combined in the same sensation, for in the combination they tend to destroy each other. Hence, in a mixture of blue and yellow only the predominating color is seen. The color-blind, then, has: I. Pure white; II. Pure black; III. Infinite varieties of gray; IV. Yellow in great variety of intensities; V. Combinations of these with varieties of gray; VI. Blue in varied intensities; VII. Combinations of these with the varieties of gray. Such sensations as red, green, orange, violet, and their combinations, are unknown to the color-blind. Red and green appear not as red and green, but give false sensations. Red verging to scarlet gives the

sensation of a combination of yellow and gray, dark shaded yellow or yellow-brown."

If I take the reds that pass from crimson towards lake I see my other color come in—a faint blue—which increases until violet is reached, when it becomes more decided. There are examples where, from the red being very strong, the blue appears to lose its effect, and the impression given is colorless black or gray. The appearance of green to the color-blind corresponds exactly to that of red. Green, in its true aspect, is impossible to them, and consequently, when neutral, *i. e.*, unmixed with any other color, it presents to their eye the appearance of gray. When mixed with yellow they see only the yellow. From this testimony, it appears that to the color-blind, in whom there is least perception of red, all red appears darker. Greens are also darker to those whom that color chiefly troubles. Both confuse these colors with gray and each other. A mixture of white and black, in the proportions to represent the luminosity of any shade of green or red, will appear as such to the color-blind. Color-blindness may therefore be defined as an insensibility of the eye to the colors red and green, or yellow and blue (or violet), or an imperfect perception of one or all of them. As we are especially interested in the red-green blind, it will be understood that the term color-blindness, as hereafter used, applies only to those whose sensations of the two colors mentioned are blunted. Color-blindness is often hereditary. Many instances of families where several members were afflicted could be mentioned; one is sufficient. On one of the railroads in this state there were employed four brothers, three of whom I found color-blind both by the worsteds and flags.

It is usually congenital, but may be produced by disease of the optic nerve and retina. Excessive use of tobacco and alcohol have been known to cause it. Typhoid fever, brain disease, and accidents occasionally bring about this defect of vision.

About the year 1835 Dr. Favre commenced the examination of employees on the Lyons Mediterranean Railroad, but for many years his examinations were somewhat imperfect, owing to the lack of certain and reliable tests. The attention of Prof. Holmgren was called to these subjects in connection with railroads, in consequence of an accident at Lagerlunda, Nov. 15, 1875, which excited the public and lead him to think that color-blindness was in a great measure responsible for the disaster. Soon after he had an opportunity to test the matter, and found that out of twenty-

two hundred soldiers, about two per cent. had defective color perception. The same year he commenced examination of railroad employees, and found about 4.8 per cent. defective. Since that time he has examined over thirty-two thousand, and found a percentage of between three and four. Prof. Donders of Utrecht, Holland, found one hundred and fifty-two with defective color-sense among twenty-three hundred railroad employees examined. In consequence of the labors of these men, the railroads of Sweden, Holland, Belgium, and France are under the supervision of competent experts, who examine all applicants for positions, and thus all danger from color-blindness is removed. In this country the indefatigable labors of Dr. Jefferies has brought the subject to the attention of the public, and secured the passage of rules requiring an examination of all recruits for the army; pilots applying for a renewal of their licenses, and all persons in the navy. Quite a number of the railroads have caused their men to be tested in regard to their color perception—notably the Pennsylvania Railroad, Illinois Central, and the Boston and Lowell. These companies have taken advantage of the services of medical experts, and by their reports conclusively show the necessity of such examinations. Connecticut is the first State to legislate on the subject, having last year passed a law requiring all employees connected with the running of trains within her borders, to be examined for visual acuteness and color perception by medical experts appointed by the Governor, and under rules and regulations prescribed by the State Board of Health. These rules designate the tests to be used, which are those experience has shown the world over to be the most accurate in the detection of all grades of color-blindness, as well as the most convenient for employment. The one most to be depended on, and, as it seems to me, by far the best in every respect, is that of various colored worsteds devised by Prof. Holmgren. Berlin worsteds are generally used tied together in small skeins. These are of red, orange, yellow, yellow-green, pure green, blue-green, purple, pink, violet, blue, brown, and gray, several shades of each color, and five gradations of each tint, from the darkest to the lightest. The greens, grays, pale grays, shades of yellow, brown, red, and pink are especially numerous. The light browns and grays are called confusion colors, from the fact that the color-blind choose them to place by the side of the sample green. Besides these small skeins, which number about one hundred, we have three large ones, called sample colors. These are

a light apple green, a purple pink (magenta medium light), and bright red. rather toward a yellowish red. These colors Prof. Holmgren has selected with great care, the light green to determine whether the color sense is or is not defective, because, according to his theory and practice, green is the whitest of colors of the spectrum, and so most easily confused with gray. The magenta is chosen to determine which of the colors, red or green, is perceived with the greatest difficulty by the color-blind under examination. The reason for this choice is, that purple or magenta is a combination of two colors, red and blue, and in the eyes of a color-blind person appears, either as one of the two colors in the combination, or like gray. The red is used only as an auxiliary test. By employing a large number of small colored skeins, an opportunity is given to the normal eye for variety in their choice, while it affords a sufficient number of "confusion" colors to those of defective color-sense to allow them to make mistakes. The examination is conducted in the following manner: From the small skeins placed in confusion on a white cloth, the light green sample is separated a short distance, and the person being examined requested to select from the large pile any skeins appearing to him of the same color as the sample, either lighter or darker. If his color perception is good, he soon places the shades of green by the side of the large skein of that color.

Having done this accurately and quickly, his examination is ended, and his color-perception found to be normal. Should he hesitate, and begin to handle the colors without placing them by the side of the sample, he is told that you do not require an exact match; but anything looking like the large skein, of the same color. He then either makes the proper selection, or puts into his pile some of the greys, or light browns, and occasionally a light pink with a few greens. He is now asked to look over his choice, and satisfy himself that he has no skeins which in his opinion do not resemble the sample. Frequently, when asked this question, the color-blind will remove from his selection one or more green skeins, leaving the grey and brown. Having by his selection shown himself of deficient color-perception, he is then tried by the second test, namely, that of the purple or magenta. The large skein of that color is placed apart from the pile, and the request made that the worsteds resembling it be laid by its side. If the examined chooses the different shades of magenta he is only defective in his perception of color, but if he places by the side of the sample ma-

genta any of the light or dark shades of blue, or violet, or the light or deep shades of one kind of green, or grey, he shows himself color-blind to either red or green. When the scarlet sample is used the color-blind select, as of the same color with red, either dark green, dark brown, or light green and light brown. Should the one examined seem confused and not to understand what is asked of him, the tests may be gone through in his presence correctly. and he be requested to repeat them. It will be noticed that no names are used, but that the person tested is simply asked to place together colors which to his eye resemble each other.

The second test employed under the rules of the State Board of Health is that of Prof. Stilling, and called Stilling Isô-Chromatic Plates. The principle of this test is letters printed in colors, on a back-ground of another color, it being difficult or impossible for the color-blind to perceive the letters, while to one of good color-sense it is quite easy. These plates have a ground-work of one color, upon which are printed small squares of several colors, resembling somewhat a checker-board, the squares of like color forming the letter. There are quite a number of these plates, suited to detect the various degrees of color-blindness. The tints of some of these plates are so arranged that they appear very plain to the red-green blind. The average eye has no difficulty in deciphering them several feet distant, but one who has failed with Holmgren's test rarely succeeds in naming the letters devised to detect his particular defect. My habit is to show the examined the plates which are plain to him, and, when he has named the letters, turn to those of the other plates, and ask him what letters he now sees. I do not recollect a single case of complete color-blindness who could pick them out, but several of the incomplete color-blind could decipher some of the plates. Another test of some value is that called Donder's Spots. This consists of small pieces of paper, of various sizes, pasted on inch squares of black velvet, and these placed upon a back ground of the same material. The paper may be of any color the examiner desires, and are of the size of 1, 2, 3, 4, or 5 millimeters respectively. A bright red or bright green spot, in a good light, gives the appearance of a speck of colored light, and when using this test the remark has often been made by the person being tried that the object looked like a colored light. Prof. Donders by repeated trials established the fact that the normal eye could, in a bright light, distinguish the color of one of these spots 1 millimeter, or 1-25 of a inch, at a distance of about fifteen feet,

larger ones in proportion. With a little calculation the test can be used to express the amount of color-deficiency.

It is conducted as follows: the one examined is placed at a distance of say fifteen feet, and told to name the color of a spot five millimeters in diameter. Should he do so, a smaller one is placed on the velvet, and so on. If he calls the color wrong he is told to come a few steps nearer and try again, and again nearer, until you are satisfied that he sees right. Other colors are used in the same way. Care must be taken that the one being tested does not look too long at the spot, for should he do so he will develop the complementary color. It is a good plan to have him come nearer and again name the spot after he has called it right; otherwise a correct guess might deceive you. After examinations had been carried on for about a month, the rules were modified by the Board of Health, and those rejected by the above tests were allowed a trial with flags and lanterns in use on the road, placed at a distance of eighty rods. The examination with flags, which I principally used, was conducted in this manner: Each of those to be tried were furnished a piece of paper numbered from 1 to 9, and one of the officers of the road with a similar slip. The flags were displayed at a distance of eighty rods, both moved and held still. As the first flag was shown, each of the above-mentioned recorded the color as it appeared to him, and against the number. After the flags were shown nine times, each one being recorded, their names were signed to the paper, and comparison made. A list was also made of the order in which the flags were to be shown. By this method the sight of the color-blind was compared with that of one of his own officers, and not with that of the examiner. 1,020 were examined by Holmgren's methods. Of these thirty-five showed themselves blind to red or green,—about $3\frac{1}{2}$ per cent. Of the thirty-five, twenty-four requested and were given a trial by flags. Of these, twenty one were unable to accurately name the color, a much larger number than I should have supposed, from the untrustworthiness of the test. In view of these results it may be asked, Why is this test with flags and lanterns not the most practical method for the detection of the color-blind on railroads? There are several objections. First, the amount of time consumed, it requiring from ten to fifteen minutes for each test, more than is possible to give where large numbers are to be examined. Again, the results are totally unreliable, being affected by light and shade, as well as surrounding objects. On this subject we have the testi-

mony of others who have used them. Dr. Owens, who has examined the employees on the Illinois Central Road, says, after considerable experience, "I have no faith in the flag and lantern test," and relates a case of a man who had answered correctly for a time, as the flags were exposed, but on the examination being continued said rather hesitatingly, as the green flag was held out, "I should call that green." When asked, "Aren't you certain of it?" again, rather hesitatingly, "I should call it green." "Could you swear that it was green?" "Oh no," said he, "I could not swear to it." A bright red flag was then held up outside a building about 400 feet away, which he called green.

As to the methods of examination, Dr. John B. Hamilton, Surgeon-General of the Marine Hospital of the United States, in his annual report, says: The Holmgren test is the only one which has proved fairly satisfactory in detecting color-blindness among pilots. He mentions instances where persons who were found blind as to a particular color were subsequently examined by signal lights, and furnished certificates. "The man who cannot distinguish green, but who knows red when shown two lights, red and green, is certain to make an exact guess as to the color he does not know." The doctor considers it better in every case to have the applicants prove that their sense of sight is acute rather than feeble, and at the same time he asserts that the assumption that the medical examiner has a peculiar and special interest in the rejection of a candidate is without foundation. He considers the examination by flags, and by lights, dangerous and uncertain, and believes that the scientific method, in that it actually detects defects, is preferable to the looser system, by which defects are overlooked. In testing for color-blindness with the above instruments, it should be proved that the men can distinguish not one or two lanterns or flags, but all those in use, and under every condition under which they could be discerned by the normal-eyed, which is a practical impossibility. If one in twenty-five are color-blind to red and green, this being the average of this defect in males, why, it may be asked, are not these mistakes more often noticed? This may depend to a certain extent upon the ignorance of people of normal eyes to the common names of colors, and in this way the defective escape detection. Then, again, when mistakes are made, they may explain that they are short-sighted to this or that color, and the explanation is satisfactory. Again, from education they may learn to associate the name of a color with the sensation it conveys to their

minds, whatever that may be, and speak of it as if it appeared to them the same as to others. They also, as Prof. Holmgren says, unconsciously seek in every way to supplement the chromatic sense nature has refused them. One color is to them paler than the other, and they accustom themselves to discern the difference in colors in the difference in the intensity of light. This was shown me by the remark of a man who, being asked the difference between a red and green sample of paint, both of which he pronounced red, said one was light red and the other dark red. In a similar way railroad men distinguish between red and green lights, the one appearing to them lighter than the other. This is all very satisfactory as long as the lights remain of the same intensity, but should any accident change this, immediately his judgment is reversed. We are often told that the railroad managers are the proper persons to examine their men, and that they have most at stake, should an accident happen from a mistake of signals. For this reason, if there is any danger from color-blindness, they would be the first to apply the remedy. Facts do not confirm these statements. It has frequently happened to me on detecting a color-blind employee to be told, "Yes, he is color-blind ; we discovered it some time ago." Still this man is daily running on trains and using signals which he may at any time mistake, being kept there for the same reason that a defective rail is not replaced, or a bridge repaired, trusting to the chance that it may be safe a little while longer. That accidents are sometimes traced to color-blindness may be proved by the collision of the tug-boat Lumberman and steamship Isaac Bell, instanced in the report of the railroad commissioners for this year, where the pilot of the tug-boat has been since found to be color-blind, and that of the steamship reported so. An editorial in the *Courant*, speaking of a collision on the Northwestern Railroad, by which fifteen persons were seriously hurt, two probably fatally, says : This was precisely the sort of accident that would result from color-blindness. "The engineer failed to see the red signal until too late. As he is living he should be examined *critically* to ascertain if he is not red-blind. It only needs a few such disasters to convince the public that it is not unreasonable to demand that the men who are responsible for thousands of lives, and who must be kept out of danger by their keenness of vision, should know a color with certainty the moment their eyes fall upon it." It will be noticed, the demand is made that the examination should be a critical one, not by flags and

lanterns. The railroad accident at the Norwalk draw-bridge is still remembered by many, both on account of its horrors and from the fact that several prominent citizens of the State were killed. The draw was open and the signal to stop displayed, but the engineer disregarded it and ran his train into the river. A member of the legislative committee, which investigated the causes of this disaster, told me a few days ago that, according to his recollection, the testimony at the time of the trial showed that the red ball, the signal to stop, was properly displayed, but that the engineer mistook it for the green ball, which meant to go on carefully, and drove his train off the bridge into the river. Wm. Pole, in speaking of railroad accidents, narrates the following: An engineer who had been looking into the fire for some moments, saw a red light as a white one, and dashed his train on a siding, and into another one standing there, causing destruction of property and loss of life.

The examinations made in consequence of the law passed by the legislature of 1880, have pretty conclusively established the fact that one in about thirty of the men employed on the railroads of the State is color-blind to red or green. Other reports show that, the world over, the defect of the sight exists in one in twenty-five, and as far as it is known will so continue in the future.

It is not strange that those having this defect of vision should be unwilling to admit it when its existence will unfavorably affect their means of obtaining a livelihood, and will persistently deny it, even when proved by the tests selected by themselves. An instance illustrating this happened at the appeal of the employés to the Board of Health from the decision of the examiners. A color-blind fireman, while loudly asserting his ability to distinguish colors, was asked, by one of the committee of engineers present, to name the color of the top of the table by the side of which he was standing. He promptly replied, "Black;—you can't confuse me on colors;" although, to the eyes of most present, it was a decided green.

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State Board of Health.

Bureau of Vital Statistics,

STATE OF CONNECTICUT.

REGISTRATION REPORT

FOR THE

Year ending December 31, 1879.

NEW SERIES.—NO. 2.

Printed by Order of the Legislature.

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State Board of Health

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and Superintendent of Registration of Vital Statistics.

State of Connecticut.

Office of the
Superintendent of Registration of Vital Statistics,
State House, Dec. 1, 1880.

To His Excellency, H. B. Bigelow,
Governor of the State of Connecticut:

Sir: In accordance with the laws of this State, I have the honor to submit the Annual Report relating to Births, Marriages, Deaths, and Divorces which occurred in Connecticut during the year 1879, from the returns required by law from the several towns.

The same general method has been pursued as adopted last year, with some additional facts not heretofore required in the abstracts, but of lasting value.

The assistance of Dr. H. S. Howe is hereby gratefully acknowledged in the compilation of the tables.

The tenth census has enabled us to add percentages which are approximately correct, and in most cases exact. I have the honor to remain,

Your very obedient servant,

C. W. CHAMBERLAIN, M.D.,
Superintendent Registration of Vital Statistics.

REGISTRATION REPORT.

1879.

The Report for this year is in several respects of more value than the last. The completion of the tenth census enables us to give the rates of births and deaths with a considerable degree of accuracy. The populations given are in many cases approximations, as the verified returns were not available when this report went to press. The errors are but slight, and not sufficient to change the rates, except beyond the decimal to which the published statements extend. In several towns the returns are so incomplete that the death rate appears excessively low. This is, in some instances, indicated by other inaccuracies in the returns, Connecticut is, however, for the most part, a very healthy state. her cities not over-crowded, and where there is considerable density of population, as in New Haven, an able and energetic local Health Board overcomes the resulting evil tendencies by efficient sanitary work, as shown by its death rate, lower than the other large cities of the state. There has been a marked increase in the accuracy of the returns this year, owing partly to the improved laws, and partly to the efforts of the Bureau of Statistics. Thus in Hartford over four hundred additional birth returns were secured; in New Haven several thousand that had heretofore passed unrecorded. Indeed, in the latter city, the records of births were completed for years back, and rendered nearly perfect. Similar results are reported in many different parts of the state. In the cities and large towns there is now sufficient inducement for the registrar to thus complete the imperfect returns, but in many of the smaller towns the difficulty still remains in securing complete birth-returns, and especially the full name of the child. As returned by the physicians eighty per cent. have only the last name of the child. This is nearly useless for purposes of identification, while answering well enough for statistics. Just how to meet this

evil is not apparent. When the doctor makes his return the child usually is not named, and in small towns it does not pay the registrar to canvass for them, while in large towns these, and those not returned by the midwives, make the labor sufficiently remunerative. As it is, this year, thousands of names have been secured that otherwise have been omitted, and several thousand added to the sum total of births, that usually have been overlooked.

In the returns of deaths the burial-permit law secures complete returns. Even where an occasional burial takes place before the certificate is obtained, it is invariably secured soon after, and but few, if any, escape record where this law is in force. It would seem that its value is so thoroughly demonstrated that it might be extended to include the cities and boroughs. Although it appears a little burdensome at first, its value in the prevention of crime, as well as in securing complete returns, commends it to the thinking people of every community. In many of the smaller towns, as East Hartford, for example, the returns of death, as well as of birth, have been completed by the direct efforts of the registrar.

In some instances nearly if not quite a third of the deaths are thus obtained. Sometimes the cemetery records are the only available source for completing the returns, which accounts for the large number reported where the cause of death is not stated. The physicians, it must be confessed, are remiss in returning deaths. The most glaring deficiency is found when a physician attends a patient in a neighboring town. In case death ensues, the return is scarcely ever made by the physician to the registrar of the town where the death occurred, and escapes record unless the registrar himself secures it. An amendment covering this was put in when the improvements alluded to before were made in the law, but was cut out by the engrossing committee of the legislature, so the evil continues unabated. This evil is especially felt when physicians in border towns come in from other states. Indeed it might be hard to meet this difficulty, but it might be remedied in our own state. As before stated, the importance of these records to every town justifies every reasonable effort that can be made to secure correctness and completeness. The vital history of each and every inhabitant is here epitomized, and the chief epochs in his life here recorded. The identification should be complete and unerring. Each year adds to their value, as the collateral evidence passes away, and the living witnesses in their turn have no other place than in a similar category. The valuable

deductions for sanitary and medical progress to be drawn from these records have been too often referred to in these pages to require further discussion.

In addition to the relations of age, sex, and nationality, the statistics of 1879 are discussed in relation to season, locality, and age at marriage of both sexes as far as may be, and also the age at maternity of native and foreign-born mothers, and the relative number of children borne by native and foreign-born mothers.

There are many facts that can be learned only from the publication of the tenth census that will be of great value in our next report. The only portion available this year is that relating directly to the population of cities and towns, and this has been utilized in preparing this report. It is to be hoped that we may have a State census also in 1885, as the population is so changeable in many parts of the State.

During the year 1879 there were 14,051 births, 552 more than in the previous year; 4,373 marriages, a gain of 88 over 1878; and 9,394 deaths, 42 in excess of last year. There were 316 divorces, 85 less than in 1878, a decided improvement resulting partly, no doubt, to the repeal of the omnibus clause in the divorce laws, as was predicted in the report of last year. It is to be hoped that the improvement will continue. This gives one divorce for every 14 marriages nearly (13.8 exactly); last year, one for every ten marriages (10.6 exactly).

The sanitary history of the State during the year has not been very unfavorable. The relative frequency of zymotics has rather decreased. One rather singular fact is shadowed in the returns, that is, a periodicity in diseases of this class, visiting different places in their turn. Of course it is too soon to determine a fact of this kind, but it is decidedly outlined, and affords an interesting subject for study.

Indeed the science of epidemiology is at best exceedingly rudimentary, but it is a fascinating study, and includes many facts of vital interest and importance to mankind. The most decided progress has been made with reference to Asiatic cholera, and even here much remains to be learned and many facts to be discovered. The malaria that is gradually creeping over our State, however, presents a practical subject for investigation. There is one striking fact, although not sufficient to explain all its manifestations, and that is, it follows the river valleys—the Connecticut, Housatonic, Farmington, Quinnipiac, Hockanum, etc., and gradually extends back from them.

The deaths from accident and violence number much less this year. There have been no steamboat explosions, no extensive railroad disasters, no tornado to swell the list.

The daily average of natural increase was 12.9.

Daily average of births, m. 20, f. 18,—38.

Daily average of marriages, 12.

Daily average of deaths, 25.6.

VITAL STATISTICS OF THE COLORED POPULATION.

COUNTIES.	BIRTHS.				MARRIAGES.	DEATHS.			
	M.	F.	N. S.	Total.		M.	F.	N. S.	Tot.
Hartford,	29	30		59	21	26	17	11	54
New Haven,	28	31	1	60	38	31	46	2	79
New London,	19	22	1	39	8	6	16	1	23
Fairfield,	24	17		41	8	10	13		23
Windham,	10	8	4	22	2	8	12		20
Litchfield,	6	10		16	5	5	4		9
Middlesex,	4	2		6	1	6	2		8
Tolland,	3	1		4	0	2	1		3
Total,	120	121	6	247	83	94	111	14	219

Excess of births over deaths, 28. This is much better than last year, when the deaths exceeded the births by 19. The total number of births also is larger by 26, the marriages by three, than in 1878, while the deaths are less by 21, a much more favorable showing.

TABLE I.

BIRTHS, MARRIAGES, AND DEATHS IN THE SEVERAL TOWNS, FOR THE YEAR ENDING DECEMBER 30, 1879.

HARTFORD COUNTY.

TOWNS.	Population in 1880.	BIRTHS. Sex. Male.	Female.	Not stated.	TOTAL.	Birth-rate per 1,000.	Parentage. Both American.	Both Foreign.	Am. Mother, For. Father.	Am. Father, For. Mother.	Unknown.	MARRIAGES. Both American.	Both Foreign.	Husband Amer.	Wife American.	Unknown.	TOTAL.	Both non-resident.	Hus. non-resident.	DEATHS. Sex. Male.	Female.	Unknown.	TOTAL.	Nativity. American.	Foreign.	Unknown.	Death-rate per 1,000.
HARTFORD	42,569	648	569	3	1220	28.6	544	555	75	46	....	222	86	33	34	..	375	48	12	376	326	11	713	523	129	61	16.7
Avon	1,057	4	11	..	15	14.1	13	1	1	....	....	9	...	...	...	..	9	...	1	8	7	...	15	14	1	....	14.1
Berlin	2,385	24	31	..	55	23.1	30	24	1	....	...	11	...	...	...	..	11	...	1	23	20	...	43	40	3	....	18.2
Bloomfield	1,346	14	12	..	26	19.3	18	6	1	1	....	6	...	...	2	..	8	...	1	4	11	...	15	12	....	3	11.1
Bristol	5,351	44	28	..	72	13.5	44	20	6	2	....	39	3	...	2	..	44	...	1	35	36	...	71	59	12	....	13.2
Burlington	1,224	9	7	..	16	13.	13	2	....	1	....	3	...	...	...	1	4	...	...	8	3	...	11	8	2	1	8.9
Canton	2,299	45	37	..	82	35.6	33	42	3	....	4	14	9	...	4	..	27	...	4	23	28	...	51	45	6	....	22.1
East Granby	754	7	4	..	11	14.5	11	...	....	....	....	2	...	...	...	..	2	...	...	3	3	...	6	6	....	....	7.9
East Hartford	3,500	28	30	1	59	16.8	38	12	5	1	3	20	4	1	3	..	28	...	2	36	33	1	70	56	4	10	20.
East Windsor	3,019	43	29	..	72	23.8	31	21	6	8	6	11	2	1	1	..	15	...	2	16	23	...	39	27	10	2	12.5
Enfield	6,756	74	59	..	133	19.8	47	40	23	18	5	27	9	3	4	..	43	8	13	58	61	...	119	19	32	68	17.6
Farmington	3,014	18	29	..	47	15.5	31	12	2	2	....	9	1	1	1	..	12	...	1	13	22	...	35	22	5	8	11.6
Glastonbury	3,580	29	28	1	58	16.2	43	11	1	3	....	25	...	1	2	..	28	1	2	15	14	...	29	26	3	....	8.1
Granby	1,340	13	13	..	26	19.4	23	3	....	....	....	10	...	...	...	..	10	...	2	5	11	...	16	11	1	4	11.9
Hartland	643	5	5	..	10	15.5	8	2	....	....	....	...	...	...	...	..	....	...	...	3	2	...	5	5	....	....	7.7
Manchester	6,468	98	63	1	162	25.	54	82	13	11	2	37	13	4	8	..	62	...	1	46	45	...	91	68	23	....	14.
Marlborough	392	3	4	..	7	17.6	6	....	....	1	....	1	...	...	...	..	1	...	...	7	3	...	10	9	1	....	25.5
New Britain	13,978	207	202	1	410	29.3	79	115	44	21	151	55	21	5	16	5	102	...	7	81	89	5	175	116	34	25	12.5
Newington	934	8	8	..	16	17.1	9	6	1	....	....	4	...	...	...	..	4	...	...	7	8	...	15	13	2	...	16.
Plainville	1,930	18	14	..	32	16.5	20	12	....	....	....	14	2	1	1	..	18	...	1	3	11	...	14	12	2	....	7.2
Rocky Hill	1,108	12	5	..	17	15.3	16	1	....	....	....	...	...	...	...	..	....	...	...	6	6	...	12	9	3	....	10.8
Simsbury	1,833	23	21	..	44	23.9	31	7	2	3	1	10	1	...	...	..	11	...	1	21	15	...	36	30	6	....	19.6
Southington	5,410	55	61	..	116	21.2	61	27	15	11	2	24	2	4	5	..	35	...	...	38	38	...	76	58	13	5	14.
South Windsor	1,902	20	19	..	39	20.5	23	11	1	3	1	6	...	...	...	..	6	...	1	7	10	...	17	16	1	....	8.9
Suffield	3,225	26	28	..	54	16.7	37	11	1	5	....	16	1	...	...	..	17	3	5	16	23	...	39	35	4	....	12.
West Hartford	1,829	13	2	..	15	8.2	13	1	....	1	....	1	...	...	...	..	1	...	...	14	6	...	20	19	1	....	10.9
Wethersfield	2,173	24	15	..	39	17.9	23	5	2	1	8	10	...	1	1	..	12	...	2	22	20	..	42	37	4	1	19.3
Windsor	3,056	32	25	..	57	18.6	35	12	7	3	....	7	...	...	1	..	8	...	2	25	28	...	53	43	10	....	17.3
Windsor Locks	2,331	27	22	..	49	21.	20	19	8	2	....	17	3	...	2	..	22	1	1	9	6	1	16	14	2	....	6.8
Total	125,406	1571	1381	7	2959	23.5	1354	1060	218	144	183	610	157	55	87	6	915	61	63	928	908	18	1854	1352	314	188	14.7

NEW HAVEN COUNTY.

TOWNS.	Population in 1880.	BIRTHS. Sex. Male.	Female.	Not Stated.	TOTAL.	Birth-rate per 1,000.	Parentage. Both Americn.	Both Foreign.	Amer. Mother. For. Father.	Amer. Father. For. Mother.	Unknown.	MARRIAGES. Both American.	Both Foreign.	Husband American.	Wife American.	Unknown.	TOTAL.	Hus. non-resident.	Both non-resident.	DEATHS. Sex. Male.	Female.	Unknown.	TOTAL.	Nativity. American.	Foreign.	Unknown.	Death-rate per 1,000.
New Haven	63,500	994	979		1973	31.2	687	660	158	83	385	299	106	31	62		498	38	7	558	504		1062	788	259	15	16.3
Beacon Falls	379	11	4		15	39.5	8	1	2	4			1				1			4	4		8	5	3		21.1
Bethany	637	10	5	1	16	25.1	16					1					1			5	5		10	10			15.8
Branford	3,047	45	37		82	26.8	52	27	3			16	4	1	2		23	2		25	25	1	51	38	13		16.7
Cheshire	2,284	22	21		43	18.8	27	9	3	4		7	2		1		10	1		13	23		36	29	7		17.7
Derby	11,652	138	141		279	23.9	86	146	34	13		42	22	5	12	2	83	4		74	70	2	146	119	27		12.5
East Haven	3,057	10	19		29	9.4	20	7	1	1		18		1			19	2		15	11		26	24	2		8.5
Guilford	2,785	28	22		50	17.9	34	11	3	1	1	17		1	1		19			21	12		33	30	3		11.8
Hamden	3,410	27	22	1	50	14.6	34	4	8	4		17			1		18	1		14	16		30	25	5		8.7
Madison	1,670	10	10		20	11.9	16	2	1	1		10			1		11			11	15		26	1		25	15.5
Meriden	18,130	273	236	2	511	28.1	166	274	51	20		75	38	9	18	1	141	11	3	143	153	1	297	226	41	30	16.3
Middlebury	688	7	2		9	13.	6	3				3			1		4			7	3		10	10			14.5
Milford	3,346	23	22		45	13 4	36	5	1	3		12		1	1		14	2		23	33		56	54	2		16.7
Naugatuck	4,281	60	45	7	112	26.1	36	53	9	14		17	9	2	12		40	6		25	22		47	37	10		10.9
North Branford	1,025	7	11		18	17.5	15	2	1			4					4			5	12		17	17			16.5
North Haven	1,763	20	9		29	16.4	19	6		1	3	7	1				8	1		10	11		21	20	1		11.9
Orange	3,341	24	28	1	53	15.8	26	22	2	3		15		1	1		17	3		22	18		40	35	3	2	11.9
Oxford	1,120	10	15		25	22.3	21	4				4					4			13	14		27	25	2		24.1
Prospect	483	6	8		14	28.9	13	1				3					3			5	7		12	12			24.8
Seymour	2,318	26	25		51	22.	23	14	10	4		16	1	1			18			21	11		32	29	3		13.8
Southbury	1,740	13	13		26	14.9	18	4	2	2		7					7	2		6	9		15	15			8.5
Wallingford	4,688	60	53	1	114	24.3	53	33	16	6	6	29	3	4	3		39			33	28		61	52	7	2	13.
Waterbury	23,019	253	261	6	520	22.5	185	230	76	23	6	88	28	10	14	3	143	2	1	137	149	5	291	212	70	9	12.6
Wolcott	493	6	4		10	20.2	7	1	1	1		2					2			3	4		7	5	2		14.1
Woodbridge	830	8	11		19	22.8	14	2	1	2		6		1			7			8	3		11	11			13.2
Total	159,686	2091	2003	19	4113	25.8	1618	1521	383	190	401	715	215	68	130	6	1134	75	11	1201	1162	9	2372	1829	460	83	14.9

NEW LONDON COUNTY.

TOWNS.	Population in 1880.	BIRTHS. Sex. Male.	Female.	Not Stated.	TOTAL.	Birth-rate per 1,000.	Parentage. Both Amer.	Both Foreign.	Amer. Mother. For. Father.	Amer. Father. For. Mother.	Unknown.	MARRIAGES. Both American.	Both Foreign.	Husband American.	Wife American.	Unknown.	TOTAL.	Hus. non-resident.	Both non-resident.	DEATHS. Sex. Male.	Female.	Unknown.	TOTAL.	Nativity. American.	Foreign.	Unknown.	Death-rate per 1,000.
NEW LONDON	11,136	133	123	5	261	23.3	126	105	15	15		66	20	6	10		102	12	4	120	125	6	251	206	45		22.5
Norwich	21,145	238	235		473	22.3	187	218	41	27		118	35	16	19		188	9	8	181	197		378	280	98		17.8
Bozrah	1,155	9	9		18	15.5	8	7	1	2		4	1				5			10	5		15	14	1		12.9
Colchester	2,974	26	40		66	22.1	27	24	13	2		23	2	1	4		30			20	24		44	34	6	4	14.8
East Lyme	1,731	20	20		40	23.5	33	4	2	1		12			1		13	3	1	21	20	1	42	30	12		24.2
Franklin	686	8	2		10	14.4	9	1				4	1				5			7	2		9	8	1		13.1
Griswold	2,745	28	18	2	48	17.5	25	23				11	8	5	2		26	2		12	19		31	26	5		11.2
Groton	5,130	45	48		93	18.1	79	4	6	4		28		1			29	2		43	41		84	80	4		16.3
Lebanon	1,845	15	15		30	16.3	23	5	2			7	1		1		9			11	13		24	22	2		13.
Ledyard	1,373	13	16	1	30	21.8	30					12			1		13			16	12		28	27	1		20.3
Lisbon	630	3	4		7	11.1	5	2				2					2			5	3		8	7	1		12.6
Lyme	1,025	10	16		26	25.3	22	2			2	7					7			6	5	1	12	12			11.6
Montville	2,666	16	15		31	11.6	19	6	5	1		13	2				15	3	1	16	19		35	33	2		13.1
North Stonington	1,769	8	13		21	11.8	21					10					10	1		15	20		35	35			19.7
Old Lyme	1,387	17	11		28	20.1	24	1	1	2		11					11			8	11		19	19			13.6
Preston	2,520	10	21	1	32	12.6	28	2	2			4	1	1	1		7			12	22		34	20	4	10	13.4
Salem	575	2	5		7	12.1	7					3					3	1		10	11		21	20	1		36.5
Sprague	3,207	58	34		92	28.7	5	85	1	1		4	27	2			33	3	11	29	26		55	40	15		17.
Stonington	7,353	67	65		132	17.9	68	50	8	6		35	8	2	8		53	13	1	62	59		121	99	22		16.4
Waterford	2,702	18	23		41	15.1	32	9				13			1		14			15	8		23	23			8.5
Total	73,754	744	733	9	1486	20.1	778	548	97	61	2	387	106	34	48		575	49	26	619	642	8	1269	1035	220	14	17.2

FAIRFIELD COUNTY.

TOWNS.	Population in 1880.	BIRTHS. Sex. Male.	Female.	Not Stated.	TOTAL.	Birth-rate per 1,000.	Parentage. Both Amer.	Both Foreign.	Amer. Mother. For. Father.	Amer. Father. For. Mother.	Unknown.	MARRIAGES. Both American.	Both Foreign.	Husband American.	Wife American.	Unknown.	TOTAL.	Hus. non-resident.	Both non-resident.	DEATHS. Sex. Male.	Female.	Unknown.	TOTAL.	Nativity. American.	Foreign.	Unknown.	Death-rate per 1,000.
DANBURY	11,619	99	103	1	203	17.4	111	57	26	8	1	72	7	5	9	..	93	4	2	78	85	10	173	133	19	21	14.8
Bridgeport	29,153	389	396	3	788	27.	327	207	97	47	110	130	32	11	25	2	200	17	23	223	218	11	452	355	82	15	15.5
Bethel	2,726	19	18	..	37	13.5	26	6	2	3	....	8	...	..	....	..	8	..	..	16	17	..	33	31	2	..	12.1
Brookfield	1,151	12	10	..	22	19.	16	6	....	....	....	4	1	..	1	..	6	..	..	8	6	..	14	14	....	..	12.1
Darien	1,902	16	10	..	26	13.6	19	3	2	2	....	9	...	..	1	..	10	1	.	6	11	1	18	12	4	2	9.4
Easton	1,145	3	9	..	12	10.4	10	2	....	....	....	7	...	..	....	..	7	..	..	9	7	..	16	16	....	..	13.9
Fairfield	3,748	38	27	..	65	17.3	35	17	6	4	3	15	3	3	1	..	22	1	..	25	26	..	51	44	7	..	13.6
Greenwich	7,956	48	35	..	83	10.4	51	21	8	3	....	13	3	5	1	..	22	3	..	39	47	..	86	64	22	..	10.8
Huntington	2,504	22	30	..	52	20.7	29	14	8	1	....	11	1	1	....	..	13	..	..	19	13	..	32	26	6	..	12.7
Monroe	1,157	7	1	..	8	6.8	8	....	....	....	....	7	1	1	....	..	9	..	..	3	5	..	8	8	....	..	6.8
New Canaan	2,674	27	35	..	62	23.1	43	13	6	....	...	12	...	..	2	..	14	5	..	16	16	..	32	29	3	..	11.9
New Fairfield	791	3	6	1	10	12.6	10	....	....	....	....	...	...	..	....	..	....	..	..	5	10	..	15	13	2	..	18.9
Newton	4,013	39	32	..	71	17.6	30	34	7	....	....	21	1	2	....	..	24	4	..	25	32	..	57	46	9	2	14.2
Norwalk	13,970	159	112	2	273	19.5	169	68	21	9	6	53	11	6	3	..	73	7	2	118	110	2	230	188	41	1	16.4
Redding	1,540	9	9	..	18	11.6	13	5	....	....	....	10	...	..	....	..	10	..	..	11	15	..	26	24	2	..	16.8
Ridgefield	2,028	19	16	..	35	17.2	30	2	1	2	....	9	...	..	1	..	10	1	1	16	13	1	30	26	4	..	14.8
Sherman	828	14	4	2	20	24.1	18	2	....	....	....	4	1	..	....	..	5	..	1	13	8	..	21	13	8	..	25.3
Stamford	11,417	114	103	..	217	19.	102	76	19	20	....	32	21	6	6	..	65	12	7	93	61	..	154	122	32	..	13.5
Stratford	4,251	20	15	..	35	8.2	25	7	3	....	....	22	1	..	2	..	25	4	..	19	15	..	34	29	5	..	7.9
Trumbull	1,323	5	9	..	14	10.5	13	1	....	....	....	8	...	..	....	..	8	..	..	8	9	..	17	16	1	..	12.8
Weston	918	6	11	..	17	18.5	15	2	....	....	....	6	...	..	2	..	8	1	..	8	6	..	14	13	1	..	15.2
Westport	3,477	39	21	6	66	18.9	43	17	2	3	1	19	2	1	4	..	26	4	..	22	33	..	55	47	8	..	15.8
Wilton	1,864	8	8	..	16	8.5	12	4	...	....	....	8	2	.	....	..	10	..	2	13	8	..	21	18	3	..	11 2
Total	112,155	1115	1020	15	2150	19.1	1155	564	208	102	121	480	87	41	58	2	668	64	38	793	771	25	1589	1287	261	41	14.1

WINDHAM COUNTY.

TOWNS.	Population in 1880.	BIRTHS.										MARRIAGES.								DEATHS.							
		Sex.					Parentage.													Sex.				Nativity.			
		Male.	Female.	Not stated.	Total.	Birth-rate per 1,000.	Both American.	Both Foreign.	Am. Mother. For. Father.	Am. Father. For. Mother.	Unknown.	Both American.	Both Foreign.	Husband Amer.	Wife American.	Unknown.	Total.	Hus. non-resident.	Both non-resident.	Male.	Female.	Unknown.	Total.	American.	Foreign.	Unknown.	Death-rate per 1,000.
Brooklyn	2,308	25	30	..	55	23.8	27	26	....	2	....	12	2	..	....	..	14	1	..	11	17	..	28	27	1	..	12.1
Ashford	1,041	8	14	..	22	21.1	22	....	....	....	....	8	....	..	....	..	8	1	1	11	11	..	22	21	1	..	21.1
Canterbury	1,272	10	25	..	35	27.5	18	16	....	1	....	5	....	..	....	..	5	..	..	5	9	..	14	11	2	1	11.
Chaplin	627	8	8	..	16	25.5	9	3	2	2	....	1	....	..	....	..	1	..	..	4	7	..	11	11	....	..	17.5
Eastford	855	9	8	..	17	19.8	15	....	1	1	....	7	....	..	....	..	7	..	2	12	2	..	14	9	5	..	16.5
Hampton	827	6	6	..	12	14.5	9	2	1	....	....	3	1	..	....	..	4	..	..	6	4	..	10	9	1	..	12.
Killingly	6,921	81	83	1	165	23.8	64	83	10	8	....	27	23	2	1	..	53	..	..	61	66	2	129	112	17	..	18.6
Plainfield	4,023	61	49	1	111	27.5	41	65	1	1	3	17	19	..	1	..	37	..	..	29	31	3	63	52	11	..	15.6
Pomfret	1,470	11	13	..	24	16.3	16	5	....	3	....	11	3	..	....	..	14	2	..	12	15	1	28	26	2	..	19.
Putnam	5,828	117	86	4	207	35.5	59	111	16	15	6	31	19	6	5	..	61	7	2	50	51	..	101	71	21	9	17.3
Scotland	540	7	8	..	15	27.7	12	2	1	....	....	3	....	..	....	..	3	..	..	2	5	..	7	6	....	1	12.9
Sterling	958	7	6	..	13	13.5	8	4	....	1	....	4	1	..	....	..	5	1	..	6	6	..	12	12	....	..	12.5
Thompson	5,054	77	64	..	141	27.8	12	122	3	4	....	13	18	6	1	..	38	1	5	54	44	..	98	78	20	..	19.3
Voluntown	1,186	16	10	..	26	21.9	16	8	1	1	....	10	1	..	....	..	11	1	..	7	7	..	14	....	....	14	11.8
Windham	8,265	100	107	..	207	25.5	82	102	13	10	....	39	12	6	5	..	62	9	3	72	78	..	150	123	22	5	18.1
Woodstock	2,638	19	11	..	30	11.3	....	....	....	30	....	12	....	..	....	..	12	2	1	9	9	..	18	16	2	..	6.8
Totals	43,813	562	528	6	1096	25.	420	539	49	79	9	203	99	20	13	..	335	25	14	351	362	6	719	584	105	30	16.4

LITCHFIELD COUNTY.

TOWNS.	Population in 1880.	BIRTHS.										MARRIAGES.								DEATHS.							
		Sex.					Parentage.													Sex.				Nativity.			
		Male.	Female.	Not Stated.	Total.	Birth-rate per 1,000.	Both Amer.	Both Foreign.	Amer. Mother. For Father.	Amer. Father. For. Mother.	Unknown.	Both American.	Both Foreign.	Husband American.	Wife American.	Unknown.	Total.	Hus. non-resident.	Both non-resident.	Male.	Female.	Unknown.	Total.	American.	Foreign.	Unknown.	Death-rate per 1,000.
Litchfield	3,410	27	31	..	58	17.0	39	17	....	2	....	24	1	..	....	..	25	2	..	18	15	..	33	24	3	6	9.6
Barkhamsted	1,300	8	11	1	20	15.3	18	1	....	1	....	8	...	..	....	..	8	2	..	6	9	..	15	13	2	...	11.5
Bethlehem	656	4	3	..	7	10.6	4	1	1	1	....	6	...	1	....	..	7	1	..	3	7	..	10	9	1	...	15.2
Bridgewater	708	5	9	..	14	19.7	12	2	....	....	....	6	1	..	....	..	7	..	..	3	3	..	6	6	...	...	8.4
Canaan	1,157	12	2	..	14	12.1	13	1	....	....	....	6	1	..	....	..	7	2	..	12	5	..	17	..	...	17	14.6
Colebrook	1,148	9	6	..	15	13.	9	1	1	1	3	3	...	..	....	..	3	..	..	14	10	..	24	10	3	11	20.8
Cornwall	1,584	17	12	..	29	18.3	23	6	....	....	....	8	...	..	....	..	8	..	..	6	6	..	12	12	...	...	7.5
Goshen	1,093	17	10	..	27	24.7	21	4	1	1	....	8	1	..	....	..	9	1	1	9	8	..	17	12	5	...	15.5
Harwinton	1,016	15	8	..	23	22.6	18	3	2	....	....	4	1	..	1	..	6	..	..	6	10	..	16	16	...	...	15.7
Kent	1,622	14	14	1	29	17.8	25	3	1	....	....	6	2	..	1	..	9	2	..	2	6	..	8	6	2	...	4.9
Morris	627	3	2	..	5	7.9	4	1	....	....	....	5	...	..	....	..	5	..	..	8	9	..	17	16	1	...	27.1
New Hartford	3,312	22	30	..	52	15.6	26	18	6	2	....	13	3	1	1	..	18	1	..	22	29	..	51	38	10	3	15.4
New Milford	3,906	41	28	..	69	17.4	49	10	1	2	7	35	2	2	1	..	40	2	..	34	25	..	59	33	8	18	15.1
Norfolk	1,418	7	6	3	16	11.2	8	6	....	2	....	9	...	1	....	..	10	..	..	14	10	..	24	18	3	3	16.9
North Canaan	1,537	26	13	..	39	25.3	30	9	....	....	....	3	1	..	....	..	4	..	..	9	11	..	20	....	...	20	13.
Plymouth	2,351	16	14	..	30	12.8	24	3	1	2	....	8	1	..	....	..	9	..	..	10	11	..	21	17	4	...	8.9
Roxbury	950	10	6	..	16	16.8	12	2	....	1	1	4	...	..	1	..	5	..	..	4	6	..	10	10	...	...	10.5
Salisbury	3,716	56	49	..	105	28.2	63	38	1	3	....	11	5	1	1	..	18	..	..	26	33	..	59	....	...	59	15.8
Sharon	2,580	26	15	..	41	15.8	27	6	4	4	....	12	...	..	1	..	13	5	..	10	14	..	24	22	...	2	9.3
Thomaston	2,351	55	40	1	96	40.8	39	39	9	4	5	16	4	3	2	..	25	1	..	11	15	..	26	23	3	...	11.
Torrington	3,327	31	38	..	69	20.7	42	17	8	2	....	18	3	2	5	..	28	2	..	24	18	..	42	32	10	...	12.6
Warren	673	2	2	3	7	10.4	6	1	....	....	....	5	1	..	....	..	6	2	..	5	2	..	7	5	2	...	10.4
Washington	1,563	15	16	..	31	19.8	26	4	1	....	....	10	...	..	....	..	10	..	3	16	18	..	34	33	1	...	21.7
Watertown	1,897	14	17	..	31	16.3	21	5	2	3	....	12	...	..	1	..	13	..	..	12	15		27	24	1	2	14.2
Winchester	5,085	58	63	..	121	23.7	59	58	2	2	....	34	7	2	5	..	48	..	..	32	42	..	74	65	9	...	14.5
Woodbury	2,152	29	18	..	47	21.8	....	....	....	....	47	8	1	..	1	..	10	..	..	20	14	..	34	32	2	...	15.8
Total	51,139	539	463	9	1011	19.7	618	256	41	33	63	282	35	13	21	..	351	23	4	336	351	..	687	476	70	141	13.4

MIDDLESEX COUNTY.

TOWNS.	Population in 1880.	BIRTHS. Sex. Male.	Female.	Not stated.	TOTAL.	Birth-rate per 1,000.	Parentage. Both American.	Both Foreign.	Am. Mother, For. Father.	Am. Father, For. Mother.	Unknown.	MARRIAGES. Both American.	Both Foreign.	Husband Amer.	Wife American.	Unknown.	TOTAL.	Hus. non-resident.	Both non-resident.	DEATHS. Sex. Male.	Female.	Unknown.	TOTAL.	Nativity. American.	Foreign.	Unknown.	Death-rate per 1,000.
MIDDLETOWN	11,704	165	125	..	290	24.7	164	83	31	12	..	63	11	8	9	..	91	7	1	86	106	..	192	146	41	5	16.4
Haddam	2,421	31	19	..	50	20.6	36	10	2	2	..	6	2	1	1	..	10	1	..	15	12	..	27	27	..	..	11.1
Chatham	1,966	17	26	..	43	21.8	31	10	2	..	..	6	..	..	..	..	6	..	..	8	15	..	23	22	1	..	11.6
Chester	1,177	7	12	..	19	16.1	16	1	..	2	..	6	2	..	..	..	8	..	..	12	10	..	22	20	2	..	18.7
Clinton	1,412	6	12	..	18	12.7	14	3	..	1	..	7	..	..	..	..	7	1	..	18	24	..	42	32	1	9	29.7
Cromwell,	1,640	14	8	..	22	13.4	6	16	..	..	..	6	1	2	..	..	9	1	..	13	7	..	20	16	4	..	12.1
Durham	990	10	7	..	17	17.1	13	4	..	..	..	6	..	..	..	..	6	..	..	8	9	..	17	15	2	..	17.1
East Haddam	3,034	21	32	..	53	17.4	48	..	2	3	..	17	1	1	..	..	19	1	..	22	20	..	42	39	3	..	13.8
Essex	1,856	20	13	..	33	17.7	29	4	..	..	..	13	..	..	1	..	14	..	..	10	18	..	28	27	1	..	15.
Killingworth	748	4	4	..	8	10.7	6	2	..	..	..	4	..	..	..	..	4	..	..	10	14	..	24	24	..	..	32.
Middlefield	928	8	4	..	12	12.9	10	2	..	..	..	1	1	..	..	..	2	..	1	6	4	..	10	9	1	..	10.7
Old Saybrook	1,305	17	15	..	32	24.4	20	8	1	3	..	7	..	..	1	..	8	..	1	8	14	..	22	20	2	..	16.8
Portland	4,162	61	39	..	100	24.0	25	71	2	2	..	15	14	..	2	..	31	1	..	41	48	..	89	67	22	..	21.3
Saybrook	1,363	8	3	..	11	8.	8	3	..	..	..	5	..	..	1	..	6	..	..	5	7	..	12	9	3	..	8.8
Westbrook	878	5	6	..	11	12.5	11	..	..	..	..	8	..	1	..	..	9	..	..	6	8	..	14	14	..	..	13.6
Totals	35,584	394	325	..	719	20.2	437	217	40	25	..	170	32	13	15	..	230	12	3	268	316	..	584	487	83	14	16.4

TOLLAND COUNTY.

TOWNS.	Population in 1880.	BIRTHS. Sex. Male.	Female.	Not Stated.	TOTAL.	Birth-rate per 1,000.	Parentage. Both Amer.	Both Foreign.	Amer. Mother. For. Father.	Amer. Father. For. Mother.	Unknown.	MARRIAGES. Both American.	Both Foreign.	Husband American.	Wife American.	Unknown.	TOTAL.	Hus. non-resident.	Both non-resident.	DEATHS. Sex. Male.	Female.	Unknown.	TOTAL.	Nativity. American.	Foreign.	Unknown.	Death-rate per 1,000.
TOLLAND	1,170	19	11	..	30	25.6	22	5	1	2	....	3	...	1	....	..	4	..	..	8	15	..	23	21	2	..	19.
Andover	429	5	2	..	7	16.3	6	....	1	....	....	2	...	..	....	..	2	..	..	2	2	..	4	4	....	..	9.4
Bolton,	512	3	6	..	9	17.5	6	1	1	1	....	1	...	..	....	..	1	..	..	....	4	..	4	4	....	..	7.8
Columbia	757	7	5	..	12	15.8	10	2	....	....	....	3	...	..	....	..	3	..	..	4	7	..	11	7	3	1	14.7
Coventry	2,044	30	21	..	51	24.9	31	14	3	3	....	8	...	..	....	..	8	..	..	9	28	..	37	34	3	..	18.1
Ellington	1,568	13	12	..	25	15.9	19	3	3	....	....	7	...	..	....	..	7	1	1	10	10	..	20	18	2	..	12.7
Hebron	1,243	10	10	..	20	16.	16	3	....	1	....	6	1	..	1	..	8	1	..	9	6	..	15	14	1	..	12.
Mansfield	2,155	19	16	..	35	16.2	30	3	2	....	....	15	1	1	....	..	17	5	..	7	17	..	24	23	1	..	11.
Somers	1,242	10	10	..	20	16.1	15	2	1	2	....	3	...	..	....	..	3	1	..	9	11	..	20	19	1	..	16.1
Stafford	4,454	45	53	..	98	22.	48	37	5	7	1	30	2	2	..4	2	40	8	3	17	21	11	49	42	7	..	11.
Union	539	9	6	..	15	27.8	14	....	....	1	....	3	...	1	.	..	4	..	1	3	4	..	7	6	1	..	12.9
Vernon	6,916	95	72	..	167	24.1	53	70	30	11	3	24	17	8	11	1	61	7	..	44	58	..	102	63	37	2	14.7
Wellington	1,086	12	16	..	28	25.7	22	3	2	1	....	6	...	..	1	..	7	..	..	6	18	..	24	21	3	..	22.
Total	24,115	277	240	..	517	21.4	292	143	49	29	4	111	21	13	17	3	165	23	5	128	201	11	340	276	61	3	14.

RECAPITULATION BY COUNTIES.

COUNTIES.	Population in 1880.	BIRTHS										MARRIAGES.								DEATHS.							Death-rate per 1,000.
		Sex.				Birth-rate per 1,000.	Parentage.													Sex.				Nativity.			
		Male.	Female.	Unknown.	Total.		American.	Foreign.	Am. Mother. For. Father.	Am. Father. For. Mother.	Unknown.	Both American.	Both Foreign.	Am. Husband.	American Wife.	Unknown.	Total.	Hus. non-resident.	Both non-resident.	Male.	Female.	Unknown.	Total.	American.	Foreign.	Unknown.	
Hartford	125,406	1571	1381	7	2959	23.5	1354	1060	218	144	183	610	157	55	87	6	915	63	61	928	908	18	1854	1362	304	188	14.7
New Haven..	159,047	2091	2003	19	4113	25.8	1618	1521	383	190	401	715	215	68	130	6	1134	75	11	1201	1162	9	2372	1829	460	83	14.9
New London.	73,754	744	733	9	1486	19.8	778	548	97	61	2	387	106	34	48	..	575	49	26	619	642	8	1269	1035	220	14	17.2
Fairfield	112,155	1115	1020	15	2150	19.1	1155	564	208	102	121	480	87	41	58	2	668	64	38	793	751	25	1569	1287	241	41	14.1
Windham...	43,813	562	528	6	1096	25.0	420	539	49	79	9	203	99	20	13	..	335	25	14	351	362	6	719	584	105	30	16.2
Litchfield....	52,011	539	463	9	1011	19.4	618	256	41	33	63	282	35	13	21	..	351	23	4	336	351	..	687	476	70	141	13.1
Middlesex...	35,586	394	325	..	719	20.2	437	217	40	25	....	170	32	13	15	..	230	12	3	268	316	..	584	487	83	14	16.4
Tolland	24,115	277	210	..	517	21.4	292	143	49	29	4	111	21	13	17	3	165	23	5	128	201	11	340	276	61	3	14.
Total....	625,887	7293	6693	65	14,051	22.4	6672	4848	1085	663	783	2958	752	257	389	17	4373	334	162	4624	4693	77	9394	7336	1544	514	15.

TABLE 2.

EXHIBITING THE NUMBER OF BIRTHS IN THE SEVERAL COUNTIES FOR EACH MONTH OF THE YEAR ENDING DECEMBER 31, 1879.

COUNTY.	SEX.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	TOTAL.
	Males.....	143	124	144	119	114	128	111	157	140	138	130	123	1,571
Hartford....	Females...	159	121	119	103	121	106	108	93	117	117	105	112	1,381
	Not stated.	....	....	....	1	1	1	....	....	1	1	1	1	7
	Males.....	204	211	197	142	145	159	172	198	174	179	154	156	2,091
New Haven..	Females...	182	151	158	162	162	179	160	182	171	172	148	175	2,003
	Not stated.	1	1	2	1	1	3	1	3	3	1	1	1	19
	Males......	71	54	56	59	56	46	55	87	85	65	65	47	744
New London.	Females...	38	40	64	62	69	65	60	63	71	62	69	70	733
	Not stated.	1	2	1	....	1	....	....	....	1	1	1	1	9
	Males.....	95	99	86	83	87	95	97	96	96	91	104	86	1,115
Fairfield.....	Females...	104	84	84	76	78	77	76	88	88	92	85	88	1,020
	Not stated.	2	2	1	1	1	4	1	....	....	3	....	....	15
	Males.....	51	52	47	43	50	49	51	43	38	42	50	46	562
Windham...	Females...	47	38	33	46	51	37	41	56	46	40	37	56	528
	Not stated.	1	1	1	....	1	....	....	1	....	....	...	1	6
	Males.....	55	38	59	45	39	54	36	59	32	49	35	38	539
Litchfield...	Females...	30	49	38	34	41	40	36	41	35	40	30	49	463
	Not stated.	....	....	3	2	....	....	....	2	1	....	1	....	9
	Males.....	36	32	26	33	36	26	38	25	44	33	35	30	394
Middlesex...	Females...	30	26	26	28	22	23	23	37	33	30	27	20	325
	Not stated.	....	....	....	....	....	....	....	....	....	....	....	....	......
	Males.....	16	19	27	20	19	16	19	23	39	20	34	25	277
Tolland.....	Females...	21	20	26	24	20	23	18	12	19	20	16	21	240
	Not stated.	....	....	....	....	....	....	....	....	....	....	....	....	......
	Males.....	671	629	642	543	546	573	579	688	648	617	607	551	7,293
Total...	Females...	611	529	548	535	564	550	522	572	580	573	517	591	6,693
	Not stated.	5	6	8	5	5	8	2	6	6	6	4	4	65
Grand Total...........		1287	1164	1198	1083	1115	1131	1103	1266	1234	1196	1128	1146	14,051

TABLE 3.

EXHIBITING THE NUMBER OF DEATHS IN THE SEVERAL COUNTIES FOR EACH MONTH OF THE YEAR ENDING DECEMBER 31, 1879.

COUNTY.	SEX.	Jauuary.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	TOTAL.
Hartford.....	Males.....	103	70	96	90	50	60	84	98	81	61	54	81	928
	Females...	105	70	99	72	69	69	79	87	62	95	35	65	908
	Not stated.	4	4	....	....	1	2	....	2	....	2	....	3	18
New Haven..	Males.....	104	97	111	111	85	102	129	109	83	98	86	86	1,201
	Females...	123	98	116	107	80	87	92	102	80	92	91	94	1,162
	Not stated.	1	....	....	1	....	1	1	2	....	2	1	....	9
New London.	Males.....	68	52	61	56	47	40	54	55	39	51	52	43	619
	Females...	54	55	64	53	54	42	39	69	59	41	54	58	642
	Not stated.	1	1	1	2	....	....	1	....	....	1	....	1	8
Fairfield.....	Males.....	90	63	82	66	56	49	75	78	69	56	57	52	793
	Females...	88	55	61	54	56	53	62	68	69	67	66	52	751
	Not stated.	2	5	1	1	3	1	1	3	1	....	....	7	25
Windham...	Males.....	26	25	31	34	27	22	32	32	28	30	32	32	351
	Females...	36	25	36	37	32	23	29	33	28	27	20	36	362
	Not stated.	....	....	....	....	....	...	2	....	....	....	1	3	6
Litchfield....	Males.....	27	36	42	28	30	23	19	39	25	23	22	23	336
	Females...	32	32	43	33	29	21	22	27	25	37	20	29	351
	Not stated.	....	....	....	....	....	....	....	....	....	....	....	....	......
Middlesex....	Males.....	28	21	27	24	22	17	24	24	18	22	14	27	268
	Females...	19	32	26	18	29	24	26	29	43	28	24	20	316
	Not stated.	....	....	....	....	....	....	....	....	....	....	....	....	......
Tolland.....	Males.....	10	9	8	15	14	8	11	12	8	9	8	16	128
	Females...	18	17	21	8	18	20	16	18	17	15	14	19	201
	Not stated.	....	....	....	1	1	...	3	3	3	....	....	....	11
Total.	Males.....	456	373	458	424	331	321	428	447	351	350	325	360	4,624
	Females...	475	384	466	382	367	339	365	433	383	402	324	373	4,693
	Not stated.	8	10	2	5	5	4	8	10	4	5	2	14	77
Grand Total............		939	767	926	811	703	664	801	890	738	757	651	747	9,394

TABLE 4.

CAUSES OF DEATHS ARRANGED BY TOWNS AND COUNTIES.

CLASS I.—ZYMOTIC DISEASES.

Towns in Hartford Co.	Order 1.—Miasmatic.																				Order 2.—Enthetic.				Order 3.—Dietic.				Total for Class 1.		
	Measles.	Scarlet Fever.	Diphtheria.	Quinsy.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Congestive Fever.	Typho-Malarial Fever.	Remittant Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Syphilis.	Hydrophobia.	Total. M.	Total. F.	Alcoholism.	Thrush.	Total. M.	Total. F.	Male.	Female.	Total.
Hartford		1	5		15	4	11	6	2	2	18	45	2		12	1	8	4	62	74	3	1	4		5	1	3	3	69	77	146
Avon	1						1				1								1	2									1	2	3
Berlin		10	1				1					1		1			1	1	10	6									10	6	16
Bloomfield							1				1	2							2	2									2	2	4
Bristol		1	2				1	1	1			2			3			5	8	8									8	8	16
Burlington																		1	1										1		1
Canton			5	1	2		8					1			5		1		10	13									10	13	23
East Granby																															
East Hartford			1				3	2			1	6	1	1					10	5									10	5	15
East Windsor			2						1			1								4										4	4
Enfield		2			6						5	10			2			2	15	12					1		1		16	12	28
Farmington												2			2			1	4	1									4	1	5
Glastonbury		1	2					2		1		2							4	4									4	4	8
Granby													1							1										1	1
Hartland																															
Manchester					2		1			4	3	10			5	1	1	1	16	12									16	12	28
Marlborough																									2		2		2		2
New Britain		9	6		2		1		1			10		5	4	1	1		19	21									19	21	40
Newington								1				1							1	1									1	1	2
Plainville			2						2				1							5										5	5
Rocky Hill									1		1	1							2	1									2	1	3
Simsbury							1				1								1	1									1	1	2
Southington			2			1		1				1	1	1	6				6	7									6	7	13
South Windsor								2	3			1							1	5									1	5	6
Suffield			2						1		1								1	3									1	3	4
West Hartford					1			1			1	1							3	1									3	1	4
Wethersfield					1		1				1		3		1				1	6									1	6	7
Windsor								2										2	3	1	1		1						4	1	5
Windsor Locks			1										1		1				1	2									1	2	3
Totals	1	24	31	1	29	5	30	18	12	7	34	97	10	8	41	3	12	17	182	198	4	1	5	...	8	1	6	3	193	201	394

CLASS II.—CONSTITUTIONAL DISEASES.

Towns in Hartford County.	Order 1.—Diathetic. Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Tabes Messenterica.	Phthisic.	Hydrocephalus.	Total. M.	Total. F.	Total for Class II. Male.	Female.	Total.
Hartford	2	16	1	7	12	..	4	123	7	77	57	84	69	153
Avon	1	..	..	..	1	..	..	3	..	2	1	2	2	4
Berlin	..	..	..	..	..	..	..	3	2	3	2	3	2	5
Bloomfield	..	1	..	..	1	..	..	1	..	..	1	..	2	2
Bristol	..	1	..	..	1	1	..	17	..	10	8	10	9	19
Burlington	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Canton	1	2	..	1	2	..	..	6	1	4	3	5	5	10
East Granby	1	..	..	1	..	..	..	2	..	..	2	1	2	3
East Hartford	..	2	..	..	2	1	..	3	..	1	3	1	5	6
East Windsor	..	1	..	1	..	1	..	7	..	3	5	4	5	9
Enfield	3	2	..	2	3	1	..	14	3	8	10	10	13	23
Farmington	..	2	..	1	1	..	..	1	..	..	1	1	2	3
Glastonbury	..	..	..	..	..	..	1	2	..	2	1	2	1	3
Granby	..	1	..	..	1	..	..	4	..	2	2	2	3	5
Hartland	1	..	..	..	1	..	..	1	..	1	..	1	1	2
Manchester	3	2	..	4	1	..	..	14	..	3	11	7	12	19
Marlborough	..	1	..	1	..	..	..	2	..	1	1	2	1	3
New Britain	..	3	..	1	2	..	3	20	..	8	15	9	17	26
Newington	..	..	..	..	..	..	..	1	..	..	1	..	1	1
Plainville	..	1	..	..	1	..	..	1	..	..	1	..	2	2
Rocky Hill	..	..	..	..	..	..	..	1	..	1	..	1	..	1
Simsbury	3	1	..	3	1	..	..	..	..	..	..	3	1	4
Southington	1	1	..	2	..	1	..	9	1	4	7	6	7	13
South Windsor	..	..	..	..	..	..	..	1	..	1	..	1	..	1
Suffield	..	..	1	1	..	..	..	..	1	1	..	2	..	4
West Hartford	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Wethersfield	..	..	1	1	..	..	3	8	..	9	2	10	2	12
Windsor	3	2	..	2	3	..	..	10	..	4	6	6	9	15
Windsor Locks	..	..	..	..	..	..	1	1	..	2	..	2	..	2
Totals	19	39	3	28	33	5	12	255	15	147	140	175	173	348

CLASS III.—LOCAL DISEASES.

Towns in Hartford County.	Order 1.—Nervous System. Apoplexy.	Paralysis.	Insanity.	Epilepsy.	Tetanus.	Convulsions.	Meningitis.	Brain Disease.	Spinal Disease.	Total. M.	Total. F.	Order 2.—Order of Cir'n. Heart Disease.	Pericarditis.	Phlebetis.	Total. M.	Total. F.	Order 3.—Respiratory System. Lung Disease.	Bronchitis.	Pneumonia.	Laryngitis.	Asthma.	Total. M.	Total. F.
Hartford	21	11	24	..	2	26	24	4	1	52	61	35	2	1	18	20	7	19	45	..	1	41	31
Avon	..	..	..	..	..	..	..	..	..	..	..	3	..	..	3	..	..	..	..	..	..	..	..
Berlin	2	3	..	..	..	..	..	..	..	1	4	3	..	..	2	1	..	..	2	..	..	2	..
Bloomfield	3	..	..	..	..	..	..	1	..	1	3	..	1	..	..	1	..	..	1	..	..	..	1
Bristol	1	3	..	..	..	..	..	1	..	3	2	3	..	..	2	1	2	..	9	..	..	5	6
Burlington	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	2	..	..	1	1
Canton	1	1	..	..	..	1	..	1	..	3	1	4	2	..	1	5	..	1	..	..	..	1	..
East Granby	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
East Hartford	1	1	..	..	2	2	..	1	1	4	4	3	..	..	2	1	2	..	7	..	..	5	4
East Windsor	2	..	..	..	..	1	1	..	..	2	2	3	..	..	1	2	..	..	3	1	..	2	2
Enfield	3	1	..	..	..	1	..	5	..	5	5	11	..	..	6	5	4	..	9	..	..	6	7
Farmington	3	..	..	..	..	1	..	1	..	2	3	1	..	..	..	1	..	2	4	..	..	1	5
Glastonbury	1	3	..	1	..	..	..	..	..	2	3	3	..	..	2	1	..	..	2	..	..	2	..
Granby	1	1	..	..	..	..	..	1	..	2	1	1	..	..	..	1	1	..	..	..	..	..	1
Hartland	..	..	..	..	..	..	..	..	1	1	..	1	..	..	1	..	..	..	..	..	..	..	..
Manchester	3	..	1	..	1	1	..	3	..	5	4	2	..	..	..	2	..	..	7	..	..	3	4
Marlborough	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..
New Britain	9	3	..	..	..	4	4	2	..	14	8	8	..	..	6	2	..	5	7	..	1	6	7
Newington	..	..	..	1	..	..	1	..	..	1	1	1	..	..	..	1	..	..	1	..	..	..	1
Plainville	1	..	..	..	..	2	1	..	..	2	2	1	..	..	..	1	..	..	1	..	..	1	..
Rocky Hill	..	..	..	..	..	..	..	1	..	..	1	3	..	..	1	2	..	..	1	..	..	..	1
Simsbury	3	1	..	1	..	..	..	1	..	3	3	1	..	..	1	..	..	..	3	..	1	2	2
Southington	3	3	..	1	..	..	2	4	..	6	7	3	1	..	2	2	..	3	7	..	..	5	5
South Windsor	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	3	..	..	2	1
Suffield	3	1	1	1	..	..	..	2	..	4	4	1	..	..	1	..	5	..	1	..	..	1	5
West Hartford	3	..	..	..	..	3	..	..	..	4	2	1	..	..	..	1	..	..	2	..	..	1	1
Wethersfield	1	1	..	..	..	..	..	4	..	3	3	..	2	..	2	..	..	..	2	..	..	..	2
Windsor	1	3	..	..	..	..	..	..	1	3	2	6	..	..	2	4	2	..	1	1	..	2	2
Windsor Locks	..	..	..	..	..	..	1	2	..	3	..	1	..	..	1	..	..	..	3	..	..	2	1
Totals	68	36	26	5	5	42	35	34	4	129	126	99	8	1	54	54	23	30	123	2	3	91	90

CLASS III.—LOCAL DISEASE—CONCLUDED.

Towns in Hartford County.	Order 4.—Digestive Organs.															Order 5.—Urinary Organs.								Order 6.—Generative Organs.			Order 8.—Integumentary System.				Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ascites.	Ulceration of Intestines.	Hernia.	Stricture of Intestines.	Stomach Disease.	Colic.	Hepatitis.	Jaundice.	Liver Disease.	Fistula.	Total. M.	Total. F.	Bright's Desease.	Diabetes.	Calculus.	Cystitis.	Kidney Disease.	Uraemia.	Total. M.	Total. F.	Ovarian Dropsy.	Disease of Uterus.	Total.	Phlegmon.	Disease of Skin.	Total. M.	Total. F.	Males.	Females.	Total.
Hartford	..	4	10	..	1	3	....	6	..	1	..	10	1	18	18	16	1	..	..	5	..	12	11	....	....	..	1	1	1	1	142	142	284
Avon	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	1	....	....	..	..	....	..	..	3	1	4
Berlin	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	..	....	....	..	..	....	..	..	6	5	11
Bloomfield	..	..	..	..	....	..	....	..	..	1	1	..	..	..	2	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	1	7	8
Bristol	1	..	..	1	....	..	....	..	..	..	..	..	..	1	1	..	..	..	1	2	1	2	2	....	....	..	..	....	..	..	13	12	25
Burlington	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	..	..	2	..	..	2	..	....	....	..	..	....	..	..	4	1	5
Canton	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	5	6	11
East Granby	..	..	..	..	....	..	....	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	2	...	2
East Hartford	1	..	..	..	....	1	....	..	..	..	..	..	..	1	1	2	..	..	..	..	..	1	1	...	1	1	..	....	..	..	13	12	25
East Windsor	1	..	1	..	....	..	....	..	..	..	..	..	..	1	1	..	..	..	..	1	..	..	1	....	....	..	..	....	..	..	6	8	14
Enfield	..	2	..	..	1	..	....	..	..	..	..	1	..	1	3	2	1	..	..	2	..	5	..	....	....	..	..	....	..	..	23	20	43
Farmington	..	..	1	..	....	..	....	..	..	1	..	..	..	1	1	1	1	..	..	..	..	1	1	....	1	1	1	....	..	..	5	12	17
Glastonbury	..	..	1	..	....	..	....	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	7	4	11
Granby	..	..	..	..	....	..	....	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	2	4	6
Hartland	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	2	...	2
Manchester	..	1	..	..	1	..	1	..	1	..	..	1	..	3	2	1	1	..	..	..	..	2	..	....	....	..	..	....	..	..	13	12	25
Marlborough	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	1	...	1
New Britain	1	4	3	..	....	..	....	1	..	..	..	..	..	7	2	3	..	..	..	..	..	1	2	1	....	1	1	....	..	1	34	23	57
Newington	..	..	..	..	....	..	....	..	..	..	..	2	..	1	1	..	..	1	..	..	..	1	..	....	....	..	..	....	..	..	3	4	7
Plainville	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	....	....	..	..	....	..	..	3	4	7
Rocky Hill	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	....	....	..	..	....	..	..	1	5	6
Simsbury	..	1	..	..	....	..	....	1	..	..	..	1	..	2	1	..	..	1	..	..	..	1	..	1	....	1	..	....	..	..	9	7	16
Southington	..	..	4	..	....	..	....	..	..	..	..	..	..	3	1	..	1	..	..	..	1	1	1	....	....	..	..	....	..	..	18	15	33
South Windsor	1	..	..	..	....	..	....	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	....	1	1	..	....	..	..	2	2	4
Suffield	1	..	..	..	....	..	....	..	..	..	..	..	..	..	1	..	1	..	..	1	..	2	..	....	....	..	..	....	..	..	8	11	19
West Hartford	..	..	..	..	....	..	....	..	..	..	..	..	..	..	..	2	..	..	..	..	..	2	..	....	....	..	..	....	..	..	7	4	11
Wethersfield	..	2	1	..	....	..	....	..	..	..	..	1	..	2	2	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	7	7	14
Windsor	..	2	1	..	1	..	....	1	..	..	..	1	..	2	4	1	..	..	1	1	..	2	1	....	....	..	..	....	..	..	11	13	24
Windsor Locks	..	..	..	..	....	..	....	..	..	..	1	..	..	..	1	..	..	..	..	..	..	..	..	....	....	..	..	....	..	..	6	2	8
	6	16	22	1	4	4	1	9	1	3	3	18	1	45	44	29	7	2	5	13	2	37	22	2	3	5	2	1	1	2	357	343	700

Towns in Hartford Co.	Class IV.—Developmental Diseases. Order 1.—Of Children. Stillborn.	Premature Birth.	Cyanosis.	Spina Bifida.	Malformations.	Teething.	Total. M.	Total. F.	Orders 2, 3, and 4. Childbirth.	Old Age. M.	Old Age. F.	Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Male.	Female.	Total.
Hartford	16	29	..	2	1	..	38	10	6	10	10	4	2	56	24	80
Avon	..	1	..	..	..	..	...	1	..	1	1	...	...	1	2	3
Berlin	1	1	..	..	..	..	1	1	..	...	2	...	1	1	4	5
Bloomfield	..	..	..	..	..	..	...	...	..	1	...	...	...	1	...	1
Bristol	..	..	..	..	..	1	...	1	..	1	5	...	...	1	6	7
Burlington	..	..	..	..	..	..	...	...	..	...	2	...	...	...	2	2
Canton	3	..	..	..	..	..	...	3	..	...	1	...	...	...	4	4
East Granby	..	..	..	..	..	..	...	...	..	...	1	...	...	...	1	1
East Hartford	..	..	..	..	..	..	...	...	..	2	4	...	...	2	4	6
East Windsor	..	3	..	..	..	..	1	2	..	2	1	...	1	3	4	7
Enfield	..	..	1	..	..	..	...	1	1	5	2	...	...	5	4	9
Farmington	..	1	..	..	..	..	...	1	..	...	...	...	...	...	1	1
Glastonbury	..	2	..	..	..	..	...	2	1	2	2	...	...	2	5	7
Granby	1	..	..	..	..	..	...	1	1	...	...	...	...	...	2	2
Hartland	..	..	..	..	..	..	...	...	..	...	1	...	...	...	1	1
Manchester	..	1	1	..	..	1	1	2	1	1	2	...	...	2	5	7
Marlborough	..	..	..	..	..	..	...	...	..	1	2	...	...	1	2	3
New Britain	10	5	..	..	..	..	7	8	2	3	4	...	...	10	14	24
Newington	..	2	..	..	..	..	2	...	..	...	2	...	...	2	2	4
Plainville	..	..	..	..	..	..	...	...	..	...	...	...	...	...	...	...
Rocky Hill	..	..	..	..	..	..	...	...	..	1	1	...	...	1	1	2
Simsbury	3	..	..	..	..	..	3	...	..	1	...	1	1	5	1	6
Southington	..	2	..	..	..	3	2	3	2	1	2	2	...	5	7	12
South Windsor	..	1	..	..	..	..	1	...	..	1	1	...	...	2	1	3
Suffield	1	1	..	..	..	..	1	1	..	1	3	...	...	2	4	6
West Hartford	..	..	..	..	..	..	...	...	..	...	...	...	...	...	...	...
Wethersfield	..	1	..	..	..	..	1	...	..	2	3	...	...	3	3	6
Windsor	..	..	..	..	..	..	...	...	..	1	2	...	...	2	1	3
Windsor Locks	..	..	..	..	1	..	...	1	1	...	...	...	...	...	2	2
Totals	35	50	2	2	2	5	58	38	15	37	4	7	5	107	107	214

Towns in Hartford Co.	Class V.—Violent Deaths. Order 1.—Accident and Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 3, 4, and 5. Homicide. M.	Order IV. Suicide. M.	Order IV. Suicide. F.	Violent.	Sudden.	Total. M.	Total. F.	Cause not reported. M.	Cause not reported. F.	Total for Class V. Male.	Female.	Total.
Hartford	1	5	2	..	7	..	13	20	8	...	2	...	..	..	...	...	8	2	26	14	40
Avon	..	1	..	..	..	..	..	1	...	...	...	...	..	..	...	...	...	...	1	..	1
Berlin	2	..	..	..	..	..	..	2	...	...	...	...	..	..	...	...	1	3	3	3	6
Bloomfield	..	..	..	..	..	..	..	...	...	...	...	...	..	..	...	...	...	...	...	..	...
Bristol	..	..	..	..	1	..	..	1	...	...	...	1	..	..	...	...	2	...	3	1	4
Burlington	1	..	..	1	..	..	..	2	...	...	...	...	..	..	...	...	1	...	3	..	3
Canton	1	..	..	..	1	..	1	3	...	...	...	...	..	..	...	...	...	...	3	..	3
East Granby	..	..	..	..	..	..	..	...	...	...	...	...	..	..	...	...	...	...	...	..	...
East Hartford	..	..	..	1	..	..	1	...	2	...	...	...	..	1	1	...	9	5	10	7	17
East Windsor	2	..	..	..	1	..	1	2	2	...	...	...	..	..	...	...	1	...	3	2	5
Enfield	1	..	..	..	1	..	..	2	...	1	...	...	..	1	1	...	...	12	4	12	16
Farmington	1	..	1	..	..	..	..	...	2	...	...	1	..	..	...	...	3	3	3	6	9
Glastonbury	..	..	..	..	..	..	..	...	...	...	...	...	..	..	...	...	...	...	...	..	...
Granby	1	..	..	..	..	..	1	1	1	...	...	...	..	..	...	...	...	...	1	1	2
Hartland	..	..	..	..	..	..	..	...	...	...	...	...	..	..	...	...	...	...	...	..	...
Manchester	2	..	1	..	..	1	..	1	3	...	2	...	1	1	1	1	4	1	8	5	13
Marlborough	..	..	..	..	..	..	1	1	...	...	...	...	..	..	...	...	...	...	1	..	1
New Britain	3	1	1	..	..	..	..	4	1	...	...	...	..	..	...	...	10	8	14	9	23
Newington	..	..	..	..	..	..	..	...	...	...	...	...	..	..	...	...	1	...	1	..	1
Plainville	..	..	..	..	..	..	..	...	...	...	...	...	..	..	...	...	...	...	...	..	...
Rocky Hill	..	..	..	..	..	..	..	...	...	...	...	...	..	..	...	...	...	...	...	..	...
Simsbury	2	..	..	..	..	2	3	2	5	...	1	...	..	..	...	...	...	...	3	5	8
Southington	1	..	..	..	1	..	..	2	...	...	1	...	..	..	...	...	1	1	4	1	5
South Windsor	1	..	..	..	..	..	..	...	1	...	...	...	..	..	...	...	1	1	...	2	2
Suffield	2	..	..	..	..	..	1	2	1	...	1	...	..	..	...	...	...	4	3	5	8
West Hartford	..	..	..	..	1	..	1	2	...	...	...	...	..	..	...	...	2	1	4	1	5
Wethersfield	..	..	..	..	..	..	..	...	...	...	1	...	..	..	...	1	...	1	1	2	3
Windsor	3	..	1	..	..	..	..	1	3	...	...	...	..	..	...	...	1	1	2	4	6
Windsor Locks	..	..	..	..	..	..	..	...	...	...	...	...	..	1	...	...	...	...	...	..	...
Totals	24	7	6	2	13	3	23	49	29	1	8	2	1	4	3	2	45	43	101	85	181

Towns in Hartford Co.	Grand Total for All Classes. Males.	Females.	Sex not Stated.	Total.
Hartford	376	326	11	713
Avon	8	7	....	15
Berlin	23	20	....	43
Bloomfield	4	11	....	15
Bristol	35	36	....	71
Burlington	8	3	....	11
Canton	23	28	....	51
East Granby	3	3	....	6
East Hartford	36	33	1	70
East Windsor	16	23	....	39
Enfield	58	61	....	119
Farmington	13	22	....	35
Glastonbury	15	14	....	29
Granby	5	11	....	16
Hartland	3	2	....	5
Manchester	46	45	....	91
Marlborough	7	3	....	10
New Britain	81	89	5	175
Newington	7	8	....	15
Plainville	3	11	....	14
Rocky Hill	6	6	....	12
Simsbury	21	15	....	36
Southington	38	38	....	76
South Windsor	7	10	....	17
Suffield	16	23	....	39
West Hartford	14	6	....	20
Wethersfield	22	20	....	42
Windsor	25	28	....	53
Windsor Locks	9	6	1	16
Totals	928	908	18	1854

TABLE.

CAUSES OF DEATH ARRANGED BY TOWNS.

CLASS I.—ZYMOTIC DISEASES.

Towns in New Haven Co.	Order I.—Miasmatic. Measles.	Small-pox.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Influenza.	Carbuncle.	Pyaemia.	Septicaemia.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittant Fever.	Congestive Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Fever.	Total. M.	Total. F.	Order II.—Enthetic. Syphilis.	Hydrophobia.	Stricture.	Total. M.	Total. F.	Order III.—Dietic. Privation.	Purpura.	Alcholism.	Worms.	Total. M.	Total. F.	Total for Class III. Male.	Female.	Total.
New Haven	6		3	28	19	15	12	6	4		1			3	15	35	3		20	3	3	2	96	82	1				1		1	3		1	3	97	86	183
Beacon Falls			1		1																	1	2	1												2	1	3
Bethany																																						
Branford																			1	2		1	3	1												3	1	4
Cheshire																1			3				1	3												1	3	4
Derby		1	2	1		2	1							1		8	1						10	7												10	7	17
East Haven									1						1					1			1	2												1	2	3
Guilford							1					1	1					1	1				1	4												1	4	5
Hamden				5													1						1	5								1		1		2	5	7
Madison																																1		1		1		1
Meriden	1		15	27	14	3	5	1	3	1				1	4	20	1		4	2			50	52								1		1		51	52	103
Middlebury				1			1							1									2	1												2	1	3
Milford				1												4							1	4												1	4	5
Naugatuck				1	2									2									2	3												2	3	5
North Branford				2	1														1					4													4	4
North Haven																	1	1					1	1												1	1	2
Orange							3					1		1	1	2							7	1												7	1	8
Oxford																	1		1		1		1	2								1		1		2	2	4
Prospect																																						
Seymour				1												4							5													5		5
Southbury							1									1					1		2	1												2	1	3
Wallingford								2	2					1	1	2			5			2	6	9												6	9	15
Waterbury			6	6	1			1	1		1				1	12			5	1	3	4	22	20								3	1	3	1	25	21	46
Wolcott								1																1													1	1
Woodbridge																																						
Total	7	1	27	73	38	20	24	11	11	1	2	2	1	10	23	89	8	2	41	9	8	10	214	204	1				1		1	10	1	8	4	222	209	431

CLASS II.—CONSTITUTIONAL DISEASES.

Towns in New Haven Co.	Order 1.—Diathetic: Dropsy & Anemia.	Cancer.	Mortification.	Total M.	Total F.	Order 2.—Tuberculous: Scrofula.	Tabes Mesenterica.	Phthisis.	Hydrocephalus.	Total M.	Total F.	Total for Class II: Male.	Female.	Total.
New Haven	5	24	..	12	17	1	23	161	11	103	93	115	110	225
Beacon Falls	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Bethany	1	..	..	..	1	..	..	..	..	..	..	..	1	1
Branford	2	1	1	1	3	..	..	9	..	6	3	7	6	13
Cheshire	..	1	..	..	1	1	..	2	..	2	1	2	2	4
Derby	2	1	..	1	2	..	..	18	2	8	12	9	14	23
East Haven	..	2	..	1	1	..	3	1	..	3	1	4	2	6
Guilford	1	3	..	1	3	..	..	4	..	3	1	4	4	8
Hamden	..	1	..	..	1	1	..	2	1	1	3	1	4	5
Madison	..	1	..	..	1	..	..	6	..	4	2	4	3	7
Meriden	2	4	..	3	3	..	4	34	..	17	21	20	24	44
Middlebury	..	..	1	..	..	..	..	2	..	2	..	2	..	2
Milford	1	..	..	..	1	..	1	3	..	1	3	1	4	5
Naugatuck	..	..	..	..	..	..	..	7	..	3	4	3	4	7
No. Branford	..	2	..	..	2	..	..	..	..	..	..	..	2	2
North Haven	..	2	..	1	1	..	..	5	..	3	2	4	3	7
Orange	..	2	..	..	2	..	1	5	..	3	3	3	5	8
Oxford	..	..	..	..	..	..	..	4	..	2	2	2	2	4
Prospect	1	..	..	..	1	..	..	3	..	1	2	1	3	4
Seymour	2	1	..	2	1	..	..	3	..	2	1	4	2	6
Southbury	..	..	..	..	..	1	..	2	..	1	2	1	2	3
Wallingford	..	2	..	..	2	..	1	4	1	2	3	2	5	7
Waterbury	3	2	..	1	4	1	..	49	6	27	29	28	33	61
Wolcott	..	1	..	..	1	..	..	3	..	1	2	1	3	4
Woodbridge	..	..	..	..	..	..	..	3	..	2	1	2	1	3
Totals	20	50	2	23	48	5	32	330	21	197	191	220	239	459

CLASS III—LOCAL DISEASES.

Towns in New Haven Co.	Order I.—Nervous System: Apoplexia.	Paralysis.	Insanity.	Chorea.	Epilepsy.	Tetanus.	Convulsions.	Brain Disease.	Spinal Disease.	Meningitis.	Total M.	Total F.	Order II.—Circulation: Pericarditis.	Aneurism.	Heart Disease.	Total M.	Total F.	Order III.—Respiratory System: Laryngitis.	Asthma.	Bronchitis.	Pneumonia.	Pleurisy.	Lung Disease.	Total M.	Total F.
New Haven	24	18	2	..	1	8	52	23	..	26	86	68	3	..	49	24	28	5	..	36	73	3	7	72	52
Beacon Falls	1	..	..	..	..	..	..	..	..	1	..	2	..	..	..	..	..	..	..	..	..	..	..	..	..
Bethany	..	1	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	2	..	..	2	..
Branford	..	4	1	..	..	..	..	2	..	2	4	5	..	..	1	..	1	..	..	..	4	..	1	3	2
Cheshire	1	4	..	..	..	..	..	..	..	1	3	3	..	..	2	1	1	..	..	2	4	..	..	2	4
Derby	5	2	..	..	..	..	9	1	..	2	6	13	..	1	5	5	1	3	..	3	14	..	6	14	12
East Haven	..	..	..	..	..	..	2	1	..	2	3	2	..	..	2	1	1	..	..	2	1	..	..	1	2
Guilford	..	5	..	..	..	..	..	..	..	1	4	2	1	..	1	2	..	..	1	..	2	..	1	2	2
Hamden	..	1	..	..	1	..	..	..	..	..	1	1	..	..	2	1	1	..	..	..	5	..	..	3	2
Madison	1	2	..	..	..	..	..	..	..	2	1	4	..	..	3	2	1	..	..	..	2	..	..	..	2
Meriden	2	5	1	..	..	..	13	7	2	5	16	19	..	..	6	4	2	..	1	3	16	..	7	16	11
Middlebury	..	1	..	..	..	..	..	..	..	..	..	1	..	..	1	..	1	..	..	..	1	..	..	1	..
Milford	1	4	..	1	..	2	1	1	..	..	5	5	1	..	..	1	..	..	..	..	5	..	10	4	11
Naugatuck	3	1	..	..	..	..	2	..	..	..	3	3	..	..	1	..	1	..	..	..	8	1	..	4	5
No. Branford	1	2	..	..	..	..	..	..	..	..	..	3	..	..	1	1	..	..	..	..	4	..	1	3	2
North Haven	2	1	..	..	..	..	1	..	..	..	1	3	..	..	1	1	..	..	..	..	3	..	..	2	1
Orange	2	..	..	..	..	..	..	1	..	..	2	1	..	..	..	..	..	..	..	1	3	..	1	2	3
Oxford	..	..	..	..	..	..	..	1	..	..	..	1	..	1	2	1	2	..	..	..	..	..	..	..	..
Prospect	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	1	1
Seymour	2	..	..	..	..	1	1	1	..	..	2	3	..	..	1	..	1	..	..	..	4	..	..	3	1
Southbury	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2	2	..	..	..	..	..	..	1	..	1
Wallingford	1	3	..	..	..	..	2	2	..	1	5	4	..	..	..	..	..	..	..	1	3	..	3	4	3
Waterbury	4	4	..	..	..	..	16	6	..	4	19	15	..	..	10	3	7	1	3	..	15	1	2	15	7
Wolcott	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..
Woodbridge	..	1	..	..	..	..	..	2	..	..	3	..	..	..	2	1	1	..	..	..	..	..	..	..	..
Totals	51	59	4	1	2	11	99	48	2	47	165	158	5	2	93	51	49	9	5	48	169	5	42	154	124

CLASS III.—LOCAL DISEASES—Concluded.

Towns in New Haven Co.	Order 4.—Digestive Organs.																Order 5.—Urinary Organs.									Order 6.—Gen'ative Organs.			Order 7.—Organs of Locomotion.				Order 8.—Integumentary System.						Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ascites.	Ulceration of Intestines.	Hernia.	Intussusception.	Stricture.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Addisons Disease.	Spleen Disease.	Total.		Nephritis.	Bright's Disease.	Diabetes.	Cystitis.	Kidney Disease.	Prostatitis.	Uræmia.	Total.		Ovarian Dropsy.	Disease of Uterus.	Total.	Necrosis and Caries.	Joint Disease.	Total.		Tumor.	Phlegmon.	Ulcer.	Skin Disease.	Total.		Males.	Females.	Total.
															M.	F.								M.	F.			F.			M.	F.					M.	F.			
New Haven	10	13	14	1	2	1			1	5	2	5		3	27	30	5	15	2	6	2		9	30	9	2	5	7		2		2			4	1	2	3	241	199	440
Beacon Falls																																								2	2
Bethany																																							3		3
Branford			2				1								1	2	1							1					1		1								10	11	21
Cheshire					1				2		1				1	3			1	1				2			1	1		1		1							9	12	21
Derby	2	3			1			1		1		1			2	7		2						2										2				2	29	35	64
East Haven																																							5	5	10
Guilford																							2	2						1	1								11	4	15
Hamden			1												1																								6	4	10
Madison													1		1											1		1	1			1							4	9	13
Meriden	2	3	4			1					1	3			4	10		1		1				1	1								1			1	1	1	42	44	86
Middlebury																																							1	2	3
Milford	1		1									2			1	3				1				1															12	19	31
Naugatuck			1							1					1	1			1	1				1	1		1	1											11	10	21
North Branford																		1						1															5	4	9
North Haven																																							4	4	8
Orange		2													1	1		1						1															6	5	11
Oxford	1			1						1	1				2	2		1	1			1		2	1														5	6	11
Prospect																			1					1																1	1
Seymour						1						1			2				1		1				2														7	7	14
Southbury								1								1							1	1			2	2											3	4	7
Wallingford						1			1						1	1					1			1															11	8	19
Waterbury	3		15						2			3			7	16		1						1			2	2		4	2	2		1				1	47	50	97
Wolcott	1															1																							2		2
Woodbridge	1															1																							4	2	6
Totals	21	21	38	2	4	4	1	2	6	8	5	15	1	3	52	79	6	22	7	10	4	1	12	48	14	3	11	14	2	8	4	6	1	3	4	2	3	7	478	447	925

CLASS IV.—DEVELOPMENTAL DISEASES.

Towns in New Haven Co.	Order 1.—of Children. Stillborn.	Order 1. Premature Birth and Debility.	Order 1. Cyanosis.	Order 1. Spina Bifida.	Order 1. Malformations.	Order 1. Teething.	Order 1. Total. M.	Order 1. Total. F.	Order 2.—of Women. Childbirth.	Order 3.—of Old People. Old Age. M.	Order 3. Old Age. F.	Order 4.—of Nutrition. Atrophy and Debility. M.	Order 4. Atrophy and Debility. F.	Total for Class IV. Males.	Total for Class IV. Females.	Total for Class IV. Total.
New Haven	58	25	..	2	6	9	45	55	4	9	23	12	11	66	93	159
Beacon Falls	1	....	..	..	..	..	...	1	.....	..	..	..	..	...	1	1
Bethany	...	....	..	..	..	..	...	...	.....	1	1	..	1	1	2	3
Branford	...	5	..	..	..	..	1	4	.....	2	3	..	..	3	7	10
Cheshire	...	1	..	..	..	.	1	...	1	..	2	..	1	1	4	5
Derby	6	13	..	1	1	..	12	9	...	3	2	..	1	15	12	27
East Haven	...	1	..	..	..	..	...	1	.....	1	..	..	1	1	2	3
Guilford	...	....	..	..	..	..	...	...	.....	4	..	..	..	4	...	4
Hamden	...	1	..	..	..	..	1	...	.....	2	2	..	..	3	3	6
Madison	1	....	..	..	..	..	...	1	.....	1	2	..	1	1	4	5
Meriden	8	19	..	..	1	2	20	10	3	..	6	2	3	22	22	44
Middlebury	...	....	..	..	..	..	...	...	.....	..	..	2	..	2	...	2
Milford	...	3	..	..	..	..	1	2	.....	..	1	..	..	1	3	4
Naugatuck	8	....	..	..	..	..	7	1	.....	1	1	1	..	9	2	11
North Branford	...	....	..	..	..	..	...	...	.....	..	..	..	..	...	...	...
North Haven	...	....	..	..	..	..	...	...	.....	1	1	..	..	1	1	2
Orange	3	2	..	..	..	..	4	1	.....	1	1	..	..	5	2	7
Oxford	1	2	1	1	..	..	3	2	.....	1	1	..	..	4	3	7
Prospect	...	...	..	..	..	..	...	...	.....	1	..	..	..	1	...	1
Seymour	3	....	..	1	..	..	3	1	1	2	..	..	..	5	2	7
Southbury	...	....	..	..	..	..	...	...	.....	..	..	..	..	...	...	...
Wallingford	4	3	..	..	..	5	2	...	.....	3	4	2	..	10	6	16
Waterbury	32	3	..	..	5	1	19	22	3	5	6	4	5	28	36	64
Wolcott	...	....	..	..	..	..	...	...	.....	..	..	..	..	...	...	...
Woodbridge	...	....	..	..	..	..	...	...	.....	1	..	..	..	1	...	1
Totals	125	78	1	5	13	17	119	110	12	39	56	23	24	184	205	389

CLASS V.—VIOLENT DEATHS.

Towns in New Haven Co.	Order 1.—Accident and Negligence. Fracture Contusion.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 3, 4, 5. Homicide. M.	Suicide. M.	Suicide. F.	Violent, not Classed Casualty. M.	Violent, not Classed Casualty. F.	Sudden. M.	Sudden. F.	Cause not Reported. M.	Cause not Reported. F.	Total. M.	Total. F.	Total for Class V. Males.	Total for Class V. Females.	Total for Class V. Total.	Grand Total. Males.	Grand Total. Females.	Grand Total. Total.	Sex not stated.
New Haven	16	1	4	3	10	3	..	31	6	1	4	2	..	..	..	..	3	8	39	16	39	16	55	558	504	1062	..
Beacon Falls	....	1	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	.	2	..	2	..	2	4	4	8	..
Bethany	1	..	..	..	..	..	..	..	1	...	..	..	..	..	..	..	1	1	1	2	1	2	3	5	5	10	..
Branford	1	..	..	..	1	..	..	2	..	..	..	..	..	..	..	..	..	1	2	1	2	1	3	25	25	51	1
Cheshire	....	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	1	...	1	1	13	23	36	..
Derby	2	..	1	..	..	1	1	4	1	..	4	..	..	..	..	..	3	1	11	2	11	2	13	74	70	146	2
East Haven	....	..	..	..	..	..	3	3	..	1	..	..	..	..	..	..	..	..	4	..	4	..	4	15	11	26	..
Guilford	....	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..		..	1	..	...	21	12	33	..
Hamden	1	..	..	..	..	..	..	1	..	..	1	..	..	..	..	..	..	..	2	..	2	..	2	14	16	30	..
Madison	....	..	..	..	1	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	1	..	1	11	16	27	..
Meriden	1	..	2	..	..	..	..	3	..	..	..	1	..	...	3	1	3	11	9	10	9	10	19	143	153	297	1
Middlebury	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...	..	...	7	3	10	..
Milford	....	..	..	..	..	..	1	..	1	..	..	..	..	..	..	..	8	2	8	3	8	3	11	23	33	56	..
Naugatuck	....	..	..	..	..	..	..	..	..	..	2	..	..	1	..	..	..	..	2	1	2	1	3	25	22	47	..
North Branford	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	...	1	1	5	12	17	..
North Haven	....	..	..	1	..	1	..	..	2	..	..	..	..	..	..	..	..	..	..	..	...	2	2	10	11	21	..
Orange	2	..	..	..	1	..	1	2	2	..	..	..	..	..	..	..	1	1	1	1	3	3	6	22	18	40	..
Oxford	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	...	1	1	13	14	27	..
Prospect	....	1	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	2	..	2	1	2	3	5	7	12	..
Seymour	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...	..	...	21	11	32	..
Southbury	1	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	11	..	1	...	2	2	7	8	15	..
Wallingford	1	..	..	..	1	..	1	2	..	..	1	..	..	..	..	..	1	..	2	..	4	..	4	33	28	61	..
Waterbury	....	..	2	..	..	1	3	5	2	..	..	..	..	...	1	1	4	6	5	7	10	9	19	137	149	291	5
Wolcott	....	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	...	..	...	3	4	7	..
Woodbridge	...1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1	8	3	11	..
Totals	27	3	9	4	15	6	11	58	17	2	13	3	..	1	4	2	24	36	90	48	101	56	157	1201	1162	2372	9

TABLE.

CAUSES OF DEATHS, ARRANGED BY TOWNS.

Towns in New London Co.	CLASS I.—ZYMOTIC DISEASES.																																				
	Order I.—Miasmatic.																						Order II.—Enthetic.						Order III.—Dietic.					Total for Class I.		
	Small-pox.	Chicken Pox.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Carbuncle.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Remittent Fever.	Typho-Malarial Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Pyaemia.	Congestive Fever.	Measles.	Total. M.	Total. F.	Syphilis.	Strict're of Urethra.	Hydrophobia.	Total. M.	Total. F.	Alchoholism.	Thrush.	Worms.	Purpurea.	Total. M.	Total. F.	Male.	Female.	Total.
New London	3	..	23	5	5	3	4	..	..	..	3	2	11	..	..	..	..	1	..	..	..	29	31	1	1	..	1	1	1	..	..	..	..	1	30	33	63
Norwich	..	1	3	3	4	14	5	..	2	..	4	3	15	..	1	1	3	1	..	..	..	31	29	..	..	..	..	..	..	1	..	..	1	..	32	29	61
Bozrah	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	1	..	..	..	2	..	..	..	..	..	..	..	..	..	..	..	..	2	..	2
Colchester	..	..	..	2	..	..	2	..	1	..	..	..	..	..	..	1	..	..	..	..	..	3	3	..	..	..	..	..	..	..	..	..	..	..	3	3	6
East Lyme	..	..	..	..	..	1	3	..	..	..	..	..	2	..	..	..	..	..	..	..	..	1	5	..	..	..	..	..	..	..	..	..	..	..	1	5	6
Franklin	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Griswold	..	..	..	10	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	2	10	..	..	..	..	..	..	..	..	..	..	..	2	10	12
Groton	..	..	..	..	..	4	5	..	..	1	..	..	..	..	..	..	..	..	..	..	..	6	4	..	..	..	..	..	..	..	..	..	..	..	6	4	10
Lebanon	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1
Ledyard	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	1	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	1	1	2
Lisbon	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	..	1
Lyme	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Montville	..	..	..	..	..	1	1	..	..	..	1	1	..	..	..	..	..	..	..	..	..	2	2	..	..	..	..	..	..	..	..	..	..	..	2	2	4
No. Stonington	..	..	..	10	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	4	7	..	..	..	..	..	..	..	..	..	..	..	4	7	11
Old Lyme	..	..	..	1	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	2	1	..	..	..	..	..	1	..	..	..	1	..	3	1	4
Preston	..	..	3	..	..	1	1	..	..	..	..	..	..	..	..	..	1	..	..	..	..	2	4	..	..	..	..	..	..	..	..	..	..	..	2	4	6
Salem	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	1	1
Sprague	..	..	..	..	1	..	6	..	2	..	..	..	3	..	..	..	..	4	..	..	..	7	9	..	..	..	..	..	..	..	..	..	..	..	7	9	16
Stonington	..	..	2	8	2	..	5	1	1	..	..	..	4	1	..	..	..	..	..	..	..	9	17	1	..	..	1	..	..	..	..	..	..	..	10	17	27
Waterford	..	..	..	..	..	1	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	1	..	..	..	1	1	2	3
Totals	3	1	31	40	13	25	34	1	6	1	9	7	38	1	1	2	7	7	..	..	..	104	125	2	1	..	2	1	2	2	..	..	2	2	108	128	236

CLASS II.—CONSTITUTIONAL DISEASES.

Towns in N. London Co.	Order I.—Diathetic. Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Scrofula.	Order 2.—Tubercular. Tabes Mesenterica.	Hydrocephalus.	Phthisis.	Total. M.	Total. F.	Total for Class II. Male.	Female.	Total.
New London	6	5	..	3	8	1	....	3	36	18	22	21	30	51
Norwich	3	9	..	5	7	2	1	7	55	27	38	32	45	77
Bozrah	....	..	..	....	....	..	....	..	....	....	....	....	....	....
Colchester	1	2	..	1	2	..	....	..	8	3	5	4	7	11
East Lyme	2	2	1	3	2	..	....	..	4	1	3	4	5	9
Franklin	....	..	..	....	....	..	....	..	....	....	....	....	....	....
Griswold	....	1	..	....	....	1	....	..	6	3	3	3	4	7
Groton	2	2	..	3	1	..	....	..	11	2	9	5	10	15
Lebanon	....	1	1	1	1	..	....	..	4	....	4	1	5	6
Ledyard	2	3	..	4	1	..	....	..	5	3	2	7	3	10
Lisbon	....	..	..	....	....	..	....	..	....	...	....	....	....	....
Lyme	....	..	..	....	....	..	....	..	....	....	....	....	....	....
Montville	....	..	..	....	....	..	2	..	4	2	4	2	4	6
N. Stonington	1	.	..	....	1	..	....	..	5	2	3	2	4	6
Old Lyme	....	..	..	....	....	..	....	..	2	....	2	....	2	2
Preston	2	1	..	1	2	..	....	1	7	1	7	2	9	11
Salem	....	..	..	...	....	..	....	1	4	2	3	2	3	5
Sprague	1	..	..	....	1	1	....	1	10	6	6	6	7	13
Stonington	3	2	..	3	2	..	....	..	9	4	5	7	7	14
Waterford	1	1	..	....	2	..	....	..	2	2	....	2	2	4
Totals	24	29	2	24	31	4	3	13	172	76	116	100	147	247

CLASS III.—LOCAL DISEASES.

Towns in N. London Co.	Order 1.—Nervous System. Apoplexy.	Paralysis.	Insanity.	Epilepsy.	Tetanus.	Convulsions.	Brain Disease.	Meningitis.	Total. M.	Total. F.	Order 2.—Organs of Circulation. Pericarditis.	Aneurism.	Heart Disease.	Embolism.	Total. M.	Total. F.	Order 3.—Respiratory System. Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
New London	1	14	2	3	..	2	11	..	17	16	..	1	17	..	11	7	1	6	..	5	..	2	7	7
Norwich	12	7	2	4	..	17	8	7	27	30	5	3	8	..	6	10	..	5	1	26	..	1	13	20
Bozrah	3	..	..	..	..	..	..	..	2	1	..	..	1	..	1	....	..	..	..	2	1	..	2	1
Colchester	..	..	..	..	..	..	1	1	1	1	..	..	4	1	1	4	..	2	..	3	..	..	1	4
East Lyme	..	..	..	..	1	1	1	..	1	2	..	..	..	..	....	....	..	..	..	4	..	1	2	3
Franklin	..	1	..	..	..	1	..	..	1	1	..	..	..	..	....	....	..	..	..	1	..	..	1	....
Griswold	..	3	..	..	..	..	..	1	2	2	..	..	..	..	....	....	..	1	..	2	..	..	3	....
Groton	1	6	1	..	..	9	7	..	17	7	..	..	4		3	1	..	..	..	6	..	..	2	4
Lebanon	1	..	..	..	..	3	..	..	1	3	..	..	1	.	1	....	..	..	..	..	..	1	1	....
Ledyard	..	3	..	..	1	..	..	2	4	2	..	..	..	..	....	....	..	1	..	2	..	..	1	2
Lisbon	..	3	..	..	..	..	..	..	1	2	..	..	..	..	....	....	..	1	.	1	..	..	1	1
Lyme	1	..	..	..	..	..	1	..	1	1	..	..	..	..	...	...	..	..	..	..	..	..	....	....
Montville	1	1	..	..	..	..	1	..	1	2	..	..	4	..	3	1	..	..	..	1	..	1	1	1
N. Stonington	1	1	..	..	..	..	1	..	1	2	..	..	2	..	2	..	..	..	..	4	..	..	1	3
Old Lyme	..	..	..	..	..	3	1	..	3	1	..	1	1	..	....	2	..	1	..	..	..	..	....	1
Preston	..	1	..	..	..	..	2	..	.....	3	..	..	1	..	1	....	..	..	..	..	..	1	1	....
Salem	1	..	1	..	..	..	..	..	1	1	2	..	4	..	3	3	..	..	..	1	..	..	1	....
Sprague	1	1	..	..	..	1	1	..	2	2	..	..	..	..	..	....	1	..	..	1	..	..	1	1
Stonington	6	2	..	1	1	2	2	..	11	3	..	1	4	1	2	4	..	1	..	7	..	..	2	6
Waterford	1	2	1	..	..	1	1	1	5	2	..	..	1	..	1	....	..	..	..	2	..	..	1	1
Totals	30	45	7	8	3	40	38	12	99	84	7	6	53	2	35	32	2	18	1	68	1	7	42	55

CLASS III.—LOCAL DISEASES—Concluded.

Towns in New London County.	Order 4.—Digestive Organs. Gastritis.	Enteritis.	Peritonitis.	Ascites.	Hernia.	Stricture of Intestine.	Stomach Disease.	Hepatitis.	Jaundice.	Liver Disease.	Fistula.	Total. M.	Total. F.	Order 5.—Urinary Organs. Bright's Disease.	Diabetes.	Calculus.	Cystitis.	Kidney Disease.	Uræmia.	Total. M.	Total. F.	Order 6.—Generative. Organs. Ovarian Dropsy.	Disease of Uterus.	Total.	Disease of Joints. Joint Disease. M.	Joint Disease. F.	Order 8.—Integu men'ry. Ulcer. M.	Ulcer. F.	Total for Class III. Males.	Females.	Total.
New London	6	1	1		3		1	1		5	1	6	13		1		1	2		3	1		2	2	1				45	46	91
Norwich	4	2	3		1		3	1	1	3		10	8		1	1	1	1		3	1				1	1			60	70	130
Bozrah																	1			1									6	2	8
Colchester			1									1		2	1			2		3	2								7	11	18
East Lyme				1									1	3						3									6	6	12
Franklin														1			1			2									4	1	5
Griswold						1							1																5	3	8
Groton							1					1		1		2				2	1					1			25	14	39
Lebanon	1												1																3	4	7
Ledyard														1				1		1	1	1		1					6	6	12
Lisbon																													2	3	5
Lyme										1		1										1		1					2	2	4
Montville														2				1		2	1								7	5	12
No. Stonington	1								1			1	1			1				1									6	6	12
Old Lyme										1			1																3	5	8
Preston								1				1																	3	3	6
Salem															1					1									6	4	10
Sprague	1		1		1			1				1	3									1		1			1	1	5	8	13
Stonington										1		1						3	1	3	1								19	14	33
Waterford										1			1														1		8	4	12
Totals	13	3	6	1	5	1	5	4	2	12	1	23	30	10	4	4	4	10	1	25	8	3	2	5	2	2	2	1	228	217	445

CLASS IV.—DEVELOPMENTAL DISEASES.

Towns in New London Co.	Order 1.—Of Children. Stillborn.	Premature Birth.	Cyanosis.	Spina Bifida.	Malformations.	Teething.	Total. M.	Total. F.	Orders 2, 3, and 4. Childbirth.	Old Age. M.	Old Age. F.	Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Male.	Female.	Total.
New London	8	1				2	9	2		8	9	1	5	18	16	34
Norwich	24			1	3	2	15	15		11	13	8	7	34	35	69
Bozrah											1				1	1
Colchester										1	1			1	1	2
East Lyme			2				1	1		1	2			2	3	5
Franklin		1					1			1	1			2	1	3
Griswold										1				1		1
Groton	3							3	1	2	8		1	2	13	15
Lebanon										3	1			3	1	4
Ledyard											2				2	2
Lisbon																
Lyme		4					2	2				2	1	4	3	7
Montville										3	3		1	3	4	7
No. Stonington	2				1		1	2					1	1	3	4
Old Lyme										1	3			1	3	4
Preston		2					1	1			3			1	4	5
Salem										2	3			2	3	5
Sprague	5	5					10		1	1	1			11	2	13
Stonington	2	1					2	1	1		7			2	9	11
Waterford										1				1		1
Totals	44	14	2	1	4	4	42	27	3	36	58	11	16	89	104	193

CLASS V.—VIOLENT DEATHS.

Towns in New London Co.	Order 1.—Accident and Negligence. Wounds.	Poison.	Drowning.	Otherwise.	Fractures.	Burns and Scalds.	Total. M.	Total. F.	Order 3.—Suicidal. M.	Order 3.—Suicidal. F.	Orders 4 and 5. Sudden.	Cause not reported.	Total. M.	Total. F.	Total for Class V. Male.	Female.	Total.	Grand Total for All Classes. Males.	Females.	Sex not Stated.	Total.
New London			4		1		5		1						6		6	120	125	6	251
Norwich			1	3	1	2	5	2	2	1		31	23	18	23	18	41	181	197		378
Bozrah					2		2					2		2	2	2	4	10	5		15
Colchester						2		2				5	5		5	2	7	20	24		44
East Lyme			3				2	1			1	5	6		8	1	9	21	20	1	42
Franklin					1		1								1		1	7	2		9
Griswold	1	1		1			1	2							1	2	3	12	19		31
Groton			1				1					3	3		4		4	43	41		84
Lebanon			1		1		2					4	1	3	3	3	6	11	13		24
Ledyard									1			1	1		2		2	16	12		28
Lisbon	1						1					1	1		2		2	5	3		8
Lyme																		6	5	1	12
Montville				2				2				4	2	2	2	4	6	16	19		35
No. Stonington			2				2								2		2	15	20		35
Old Lyme												1	1		2	3	5	8	11		19
Preston												6	4	2	4	2	6	12	22		34
Salem																		10	11		21
Sprague																		29	26		55
Stonington	2				3		5					31	19	12	24	12	36	62	59		121
Waterford											1	2	3		3		3	15	8		23
Totals	4	1	12	6	9	4	27	9	4	1	2	96	69	39	94	49	143	619	642	8	1269

TABLE.

CAUSES OF DEATHS, ARRANGED BY TOWNS.

Towns in Fairfield Co.	CLASS I.—ZYMOTIC DISEASES. Order 1.—Miasmatic.																					Order 2.—Enthetic.				Order 3.—Dietic.						Total for Class 1.		
	Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Carbuncle.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Remittent Fever.	Typho-Malarial Fever.	Congestive Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Pyaemia.	Total. M.	Total. F.	Syphilis.	Hydrophobia.	Total. M.	Total. F.	Privation.	Alcoholism.	Thrush.	Worms.	Total. M.	Total. F.	Male.	Female.	Total.
Danbury		1	1	2	1	1				3		4					1		1	4	11											4	11	15
Bridgeport		10	9	13	4	11	3			7	5	21	1	2	6	1	6	11		68	72						3			3		71	72	143
Bethel				1								1								1	1											1	1	2
Brookfield																										1					1		1	1
Darien														1				1			2												2	2
Easton															1						1												1	1
Fairfield		3	3	1						1		2	4		1		1			5	11											5	11	16
Greenwich	1	10	1			3				1		2				1				9	10											9	10	19
Huntington							1			1							2			3	1						1			1		4	1	5
Monroe																																		
New Canaan			1	4		1							3		1					3	4											3	4	7
New Fairfield				1																	5								1		1		2	2
Newtown						3						1								3	1											3	1	4
Norwalk		15	1	2	2	1				6	1	9		1	6			1		26	19											26	19	45
Reading		1		2																	3												3	3
Ridgefield								1			1									1	1											1	1	2
Sherman					1							1		2				1		4	1											4	1	5
Stamford	3		5	7	1	4	1	1		4	3	9	1		1	1	1	1		26	17	1		1								27	17	44
Stratford		1	1					1									1			2	2											2	2	4
Trumbull			2									1			2					1	4											1	4	5
Weston						1														1												1		1
Westport				2			1			1	1	2			3	1		2		5	8											5	8	13
Wilton						1			1	1										1	2											1	2	3
Totals	4	41	54	32	9	26	6	3	1	25	11	53	9	6	21	4	12	17	1	163	172	1		1		1	4		1	4	2	168	174	342

CLASS II.—CONSTITUTIONAL DISEASES.

Towns in Fairfield County.	Order 1.—Diathetic.					Order 2.—Tubercular.						Total for Class II.		
	Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Scrofula.	Tabes Mesenterica.	Phthisis.	Hydrocephalus.	Total. M.	Total. F.	Male.	Female.	Total.
Danbury	2	5	2	4	5	1		23		15	9	19	14	33
Bridgeport	14	7		6	15	2	1	61	3	37	30	43	45	88
Bethel								8		4	4	4	4	8
Brookfield	1			1				1			1	1	1	2
Darien		2			2			1		1		1	2	3
Easton			1		1								1	1
Fairfield								4		1	3	1	3	4
Greenwich		2			2	1	1	11	1	5	8	5	10	15
Huntington		2		1	1			6		2	4	3	5	8
Monroe								1			1		1	1
New Canaan								5		2	3	2	3	5
New Fairfield		2		2				2			2	2	2	4
Newtown	2				2			9		6	3	6	5	11
Norwalk	5	7		3	9		1	40		23	18	26	27	53
Redding		2			2			7		5	2	5	4	9
Ridgefield	1	2		1	2			2		1	1	2	3	5
Sherman		2			2			3		1	2	1	4	5
Stamford	6	2		2	6			20		8	12	10	18	28
Stratford		1		1			1	6		2	5	3	5	8
Trumbull	1	1		1	1			1			1	1	2	3
Weston		2		1	1			1		1		2	1	3
Westport	2	4		3	3			2			2	3	5	8
Wilton	1		1	1	1			6		4	2	5	3	8
Total	35	43	4	27	55	4	4	220	4	118	113	145	168	313

CLASS III.—LOCAL DISEASES.

Towns in Fairfield County.	Order 1.—Nervous System.										Order 2.—System of Circulation.					Order 3.—Respiratory System.							
	Apoplexia.	Paralysis.	Insanity.	Epilepsy.	Tetanus.	Convulsions.	Brain Disease.	Meningitis.	Total. M.	Total. F.	Pericarditis.	Aneurism.	Heart Disease.	Total. M.	Total. F.	Laryngitis.	Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
Danbury	2	5	2			3	1	2	7	8			6	3	3				5		4	7	2
Bridgeport	11	8	1		1	15	15	6	32	25	1		15	12	4	1	5	2	18		3	18	11
Bethel	3			1		1	1		2	4			1	1					1	1	3	2	3
Brookfield	2	2					1		4	1			1	1									
Darien		1								1									4			1	3
Easton													4	3	1		1		2			2	1
Fairfield		2							1	1		1	5	3	3			2	6		1	5	4
Greenwich	2	2			1		4		3	6			8	5	3				10	3		9	4
Huntington					1		2		2	1									2		1	2	1
Monroe	1	1						1	1	2			1		1								
New Canaan	3					2			3	2			3		3				3			3	3
New Fairfield							1		1				1		1				7		1		2
Newtown	2	2				3	1		2	6			4	1	3	1			7			3	5
Norwalk	9	14			1	7	4	5	17	23			8	3	5		5		22		5	22	10
Redding	2				1				1	2			1		1				1				1
Ridgefield	2	2					1		4	1			2	2			1		1		4	3	3
Sherman		1								1									2		1	2	1
Stamford	2	4	2	1		5	2	2	12	6			10	6	4		2		14	2		13	5
Stratford		1		1		1	2		3	2			1		1				2		1	1	2
Trumbull						1				1							1		1				2
Weston	1	1				1			2	1			1		1				1		2	1	2
Westport		3				2		1	2	4			5	2	3				2			1	1
Wilton													1	1									
Total	42	48	5	3	5	41	35	17	99	98	1	1	78	43	37	2	15	4	105	6	26	95	66

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Fairfield Co.	Order 4.—Digestive Organs. Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Tumor of Bowels.	Intussusception.	Stomach Disease.	Colic.	Hepatitis.	Jaundice.	Liver Disease.	Total. M.	Total. F.	Order 5.—Urinary Organs. Nephritis.	Bright's Disease.	Diabetes.	Cystitis.	Kidney Disease.	Uræmia.	Total. M.	Total. F.	Order 6.—Generative Organs. Ovarian Dropsy.	Disease of Uterus.	Total.	Order 7.—Locomotive Organs. Arthritis.	Joint Disease.	Caries and Necrosis.	Total. M.	Total. F.	Order 8.—Integumentary System. Phlegmon.	Ulcer.	Total. M.	Total. F.	Total for Class III. Males.	Females.	Total.
Danbury	1		2									1	3	1			1				1										1			1	21	15	36
Bridgeport	4	4	2	2	1		1	1				1	6	10		4			3		3	4	2	1	3	1				1					71	58	129
Bethel	1												1			1					1			1	1										7	8	15
Brookfield	1							1					1	1																					6	2	8
Darien									1				1																						2	4	6
Easton	1													1										1	1										5	4	9
Fairfield						1								1	1		1				2		1		1			1		1					11	11	22
Greenwich	1		2		1			1					1	4	1							1	1		1							2	1	1	19	20	39
Huntington						1								1			1			1		2													5	5	10
Monroe																1					1														2	4	6
New Canaan			2								1		1	2		2					2														9	7	16
New Fairfield																																			1	3	4
Newtown		2		1								1	3	1		1					1														10	15	25
Norwalk	4	1	1	1	1			5		1			7	7	2	4		1	1		5	3					1		1						55	48	103
Redding																	1				1														2	4	6
Ridgefield		1																			1														10	4	14
Sherman				1								1	2																						4	2	6
Stamford	2			1							2	2	5	2		1					1														37	17	54
Stratford			1									1	2			1						1													6	6	12
Trumbull																																				3	3
Weston			1										1																						4	4	8
Westport	1		3										1	3		1					1														7	11	18
Wilton								1					1						1		1		1		1										3	1	4
Totals	16	8	14	6	3	2	1	9	1	1	3	7	36	34	4	16	4	1	5	1	21	11	5	3	8	1	1	1	1	2	1	2	1	2	297	256	553

Towns in Fairfield Co.	Class IV.—Developmental Diseases. Order 1.—Of Children. Stillborn.	Premature Birth and Debility.	Cyanosis.	Teething.	Total. M.	Total. F.	Order 2.—Of Women. Childbirth.	Order 3.—Of Old People. Old Age. M.	Old Age. F.	Order 4. of Nutrition. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
Danbury	1		1		1	1	1	7	14		1	8	17	25
Bridgeport	5	21	2	3	16	15	2	5	4	5	8	26	29	55
Bethel	3	1			3	1	1		2			3	4	7
Brookfield		1				1							1	1
Darien		3			2	1		1	1			3	2	5
Easton	1				1			1	2			2	2	4
Fairfield	1	3	2		5	1		1				6	1	7
Greenwich							3	4	2		1	4	6	10
Huntington		1				1	1	4				4	2	6
Monroe									1				1	1
New Canaan								1	1			1	1	2
New Fairfield							2	2				2	2	4
Newtown	4					4	1	3	1		3	3	9	12
Norwalk	6	3			2	7	1	5	6			7	14	21
Redding	1	1				2		3	2			3	4	7
Ridgefield	1					1		1	3			1	4	5
Sherman								2	1			2	1	3
Stamford							2	6	2	5	5	11	9	20
Stratford		2			2			2	1	1		5	1	6
Trumbull								3				3		3
Weston								1	1			1	1	2
Westport	2	2			2	2	1	1	2	1	1	4	6	10
Wilton							1	1				1	1	2
Total	25	38	5	3	34	37	16	54	46	12	19	100	118	218

Towns in Fairfield Co.	Class V.—Violent Deaths. Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Poison.	Drowning.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 3, 4, 5. Homicide. M.	Order 3.—Suicide. M.	Suicide. F.	Hanging.	Order 6. Violent Death not Casualty.	Sudden; Cause unascertained.	Cause not reported.	Total. M.	Total. F.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.	Sex not stated.
Danbury					1		2	2	1		1	1			2	47	28	26	26	28	54	78	85	173	10
Bridgeport	9		2	2	2	1	1	11	6		1		1		4	3		8	12	14	26	223	218	452	11
Bethel															1		1		1		1	16	17	33	
Brookfield															2		1	1	1	1	2	8	6	14	
Darien																1		1		1	1	6	11	18	1
Easton							1		1											1	1	9	7	16	
Fairfield	1							1			1								2		2	25	26	51	
Greenwich	2						1	2	1										2	1	3	39	47	86	
Huntington							2	2								1	1		3		3	19	13	32	
Monroe																1	1		1		1	3	5	8	
New Canaan	1								1		1								1	1	2	16	16	32	
New Fairfield	1								1											1	1	5	10	15	
Newtown	1						1	2			1							2	3	2	5	25	32	57	
Norwalk	1	1		1	1		1	3	2		1								4	2	6	118	110	230	2
Redding			1					1										1	1		1	11	15	26	
Ridgefield				1				1			1					1			2	1	3	16	13	30	1
Sherman											1					1	1		2		2	13	8	21	
Stamford				1				1			3			3	1	1	4		8		8	93	61	154	
Stratford	1							1		1	1	1							3	1	4	19	15	34	
Trumbull	1							1								2	2		3		3	8	9	17	
Weston																						8	6	14	
Westport				1					1			1		1		3	3	1	3	3	6	22	33	55	
Wilton	1						3	3	1										3	1	4	13	8	21	
Total	19	1	3	6	4	1	12	31	17	1	12	3	1	4	10	61	37	40	81	58	139	793	771	1589	25

TABLE.

CAUSES OF DEATHS, ARRANGED BY TOWNS.

Towns in Windham Co.	Class I.—Zymotic Diseases. Order 1.—Miasmatic.																	Order 2.—Enthetic.			Order 3.—Dietic.					Total for Class I.		
	Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Dysentery.	Diarrhea.	Cholera Infantum.	Remittent Fever.	Congestive Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Syphilis.	Total. M.	Total. F.	Worms.	Alcoholism.	Pyæmia.	Total. M.	Total. F.	Males.	Females.	Total.
Brooklyn				1						1	1					3										3		3
Ashford			4								1					4	1									4	1	5
Canterbury						1											1										1	1
Chaplin			1													1										1		1
Eastford																												
Hampton		1	3	1												4	1									4	1	5
Killingly	1	1	6		2	2			1	1	7			1		13	9									13	9	22
Plainfield		1				3	1		1		1		1			5	3									5	3	8
Pomfret			1			1				1		2				2	3									2	3	5
Putnam				4		2		1		3	5			1		11	5									11	5	16
Scotland																												
Sterling																												
Thompson			8	10	1	1	2				1				2	12	13									12	13	25
Voluntown				2	1						2					2	3									2	3	5
Windham			6		1	3		2			4					6	10									6	10	16
Woodstock			1			1			2						1	3	2									3	2	5
Totals	1	3	30	18	5	14	3	3	4	6	22	2	1	2	3	66	51									66	51	117

Towns in Windham Co.	CLASS II.—CONSTITUTIONAL DISEASES. Order 1.—Diathetic. Dropsy and Anemia.	Cancer.	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Tabes Mesenterica.	Phthisis.	Total. M.	Total. F.	Total for Class II. Male.	Female.	Total.	CLASS III.—LOCAL DISEASES. Order 1.—Nervous System. Apoplexy.	Paralysis.	Insanity.	Epilepsy.	Convulsions.	Brain Disease.	Meningitis.	Total. M.	Total. F.	Order 2.—Organs of Circulation. Pericarditis.	Aneurism.	Heart Disease.	Total. M.	Total. F.	Order 3.—Respiratory System. Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
Brooklyn							2	1		3		3	3				1		2		1	2			1	1			1	1		1	1	2
Ashford		1			1			3	1	2	1	3	4					1	1		1	1			1	1		1		3			2	2
Canterbury								4	4		4		4	2	1							3			3	1	2			1				1
Chaplin	2			1	1			3	1	2	2	3	5	1	1							2								1				1
Eastford								3	1	2	1	2	3		1						1									3		4	7	
Hampton								1	1		1		1	1					1		1	1								1				1
Killingly		2			2		1	25	9	17	9	19	28	2	7	1		1		5	9	7			13	5	8	1		13			6	8
Plainfield	1	2		1	2			10	4	6	5	8	13	5			1		2	1	2	7			4	2	2			5		3	5	3
Pomfret	1	1			2	1		2	1	2	1	4	5	2					1	1	3	1						1		2				3
Putnam	2		1	1	2			15	8	7	9	9	18	1				1		2	4		1		2		3	1	1	5	1	10	11	7
Scotland	1				1			3	1	2	1	3	4																			1		1
Sterling	1	2		2	1			1	1		3	1	4		3				1		1	2			1		1							
Thompson	1			1			1	6	4	3	5	3	8		1			1	3		3	2		1	1	1	1			12		1	9	4
Voluntown								2		2		2	2		1				1		2				4	2	2							
Windham	1	1	1	1	2			17	8	9	9	11	20	4	6				4		8	6			8	2	6	1	1	1	1	4	3	5
Woodstock								2		2		2	2						3		3				1	1								
Totals	10	9	2	7	14	1	4	98	44	59	51	73	124	18	21	1	2	4	19	9	39	34	1	1	39	16	25	5	3	48	2	24	44	38

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Windham Co.	Order 4.—Digestive Organs.												Order 5.—Urinary Organs.							Order 6.—Generative Organs.			Order 7.—Integumentary.		Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Stomach Disease.	Colic.	Hepatitis.	Jaundice.	Liver Disease.	Total.		Nephritis.	Bright's Disease.	Diabetes.	Cystitis.	Kidney Disease.	Total.		Ovarian Dropsy.	Disease of Uterus.	Total.	Skin Disease.		Males.	Females.	Total.
											M.	F.						M.	F.			F.	M.	F.			
Brooklyn	....	....	....	....	1	1	....	....	....	1	1	2	....	....	....	....	....	....	....	....	....	....	1	....	5	6	11
Ashford	....	....	1	....	....	....	....	1	....	1	1	2	....	....	....	1	....	1	....	....	....	....	....	....	6	5	11
Canterbury	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	6	7
Chaplin	....	1	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1	3	4
Eastford	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8	....	8
Hampton	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2	3
Killingly	2	....	....	....	1	....	....	....	....	1	2	2	....	....	....	....	1	1	....	....	....	....	....	....	23	25	48
Plainfield	....	....	....	....	1	....	2	....	1	....	3	1	....	....	....	....	1	1	....	....	1	1	....	....	13	14	27
Pomfret	....	1	....	....	....	....	....	....	1	....	1	1	....	1	....	....	....	1	....	....	....	....	....	....	5	5	10
Putnam	....	....	....	....	....	4	2	....	....	1	4	3	....	....	1	....	....	....	1	....	....	....	....	....	19	14	33
Scotland	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	2
Sterling	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	1	....	....	....	....	....	....	2	3	5
Thompson	1	....	....	....	....	2	....	1	....	3	3	4	1	1	....	....	2	3	1	....	....	....	....	....	19	12	31
Voluntown	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1	....	....	....	....	....	....	5	2	7
Windham	1	2	....	....	....	....	....	....	....	1	2	2	....	1	....	....	....	....	1	1	....	1	....	....	15	21	36
Woodstock	....	1	1	1	....	....	....	....	....	....	....	3	....	1	....	....	....	1	....	....	....	....	....	....	5	3	8
Totals	5	5	2	1	3	7	4	2	2	8	19	20	2	4	2	1	4	10	3	1	1	2	1	....	129	122	251

CLASS IV.—DEVELOPMENTAL.

Towns in Windham Co.	Order 1.—Of Children. Stillborn.	Premature Birth.	Cyanosis.	Spina Bifida.	Other Malformation.	Teething.	Total. M.	Total. F.	Orders 2, 3, 4. Childbirth.	Old Age. M.	Old Age. F.	Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Males.	Females.	Total.
Brooklyn	1	4	2				3	4			2			3	6	9
Ashford									1				1		2	2
Canterbury		1						1			1				2	2
Chaplin																
Eastford										2				2		2
Hampton																
Killingly	10	5					8	6	1	3	3			11	11	22
Plainfield	5	2					4	3	1	1	2			5	6	11
Pomfret	2					1	3				2			3	2	5
Putnam	1	3				1	4	1	1	1	4			5	6	11
Scotland											1				1	1
Sterling	1							1			1	1		1	2	3
Thompson		5					2	3	1	1	2			3	6	9
Voluntown																
Windham	10	9		1	1		12	9	2	2	4	2	1	15	16	31
Woodstock										1	1			1	1	2
Totals	30	29	2	1	1	2	36	28	7	12	23	3	2	49	61	110

CLASS V.—VIOLENT DEATHS.

Towns in Windham Co.	Order 1.—Accident or Negligence. Fractures.	Wounds.	Burns and Scalds.	Drowning.	Otherwise.	Total. M.	Total. F.	Order 4.—Suicide. Poison.	Drowning.	Hanging.	Otherwise.	Total. M.	Total. F.	Order 6. Violent.	Sudden.	Cause not reported.	Total. M.	Total. F.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Total.	Sex not stated.
Brooklyn					1		1									1		1		2	2	11	17	28	
Ashford																						11	11	22	
Canterbury																						5	9	14	
Chaplin								1					1							1	1	4	7	11	
Eastford					1	1													1		1	12	2	14	
Hampton																1		1		1	1	6	4	10	
Killingly			1		4	4	1			1	1	1	1						5	2	7	61	66	129	2
Plainfield		1				1																29	31	63	3
Pomfret					1	1										1		1	1	1	2	12	15	28	1
Putnam	1			1		1	1				1	1		1		14	12	8	14	9	23	50	51	101	
Scotland																						2	5	7	
Sterling																						6	6	12	
Thompson				1			1									23	15	9	15	10	25	54	44	98	
Voluntown																						7	7	14	
Windham	1	1	1	2	2	7			2		1	2	1			37	19	19	28	20	48	72	78	150	
Woodstock																1		1		1	1	9	9	18	
Totals	2	2	2	4	9	15	4	1	2	1	3	4	3	1		83	46	40	64	47	111	351	362	719	6

TABLE.

CAUSES OF DEATHS, ARRANGED BY TOWNS.

CLASS I.—ZYMOTIC DISEASES.

Towns in Litchfield Co.	Order 1.—Miasmatic. Measles.	Scarlet Fever.	Diphtheria.	Croup.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Dysentery.	Cholera Infantum.	Intermittent Fever.	Remittent Fever.	Typho-Malarial Fever.	Congestive Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Order 2.—Enthetic. Syphilis.	Hydrophobia.	Total. M.	Total. F.	Order 3.—Dietic. Thrush.	Privation.	Total. M.	Total. F.	Total for Class I. Male.	Female.	Total.
Litchfield		2				1	1		2							3	3									3	3	6
Barkhamsted			1											1		1	1									1	1	2
Bethlehem										1							1										1	1
Bridgewater																												
Canaan				1					1			1			1	1	3									1	3	4
Colebrook			1							1						1	1		1	1						2	1	3
Cornwall									1					1	1	1	2									1	2	3
Goshen								3								1	2									1	2	3
Harwinton				2													2										2	2
Kent							1		1		2					2	2						1		1	2	3	5
Morris																												
New Hartford	1			1	1	1								1		1	4					1			1	1	5	6
New Milford		1			4				1		1	2	1			8	2									8	2	19
Norfolk									2							1	1									1	1	2
North Canaan			2		1				1				1			4	1									4	1	5
Plymouth							1										1										1	1
Roxbury									2							1	1									1	1	2
Salisbury		1			2				7				1		1	6	6						1	1		7	6	13
Sharon		1			1												2										2	2
Thomaston		1			1											1	1									1	1	2
Torrington					2			6	1	1		2	1			6	7									6	7	13
Warren																												
Washington								5								1	4									1	4	5
Watertown									1							1										1		1
Winchester		2	8		3	3							1			9	8					1			1	9	9	18
Woodbury								1	1	1						2	1									2	1	3
Totals	1	9	12	4	15	5	3	15	21	4	3	5	5	3	3	51	56	...	1	1	...	2	2	1	3	53	59	112

CLASS II.—CONSTITUTIONAL DISEASES.

Towns in Litchfield Co.	Order 1.—Diathetic. Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Tabes Mesenterica.	Phthisis.	Hydrocephalus.	Total. M.	Total. F.	Total for Class II. Male.	Female.	Total.
Litchfield	...	1	1	1	1	....	....	2	....	..	2	1	3	4
Barkhamsted	1	1	....	..	2	....	....	..	....	..	..	..	2	2
Bethlehem	1	1	....	..	2	....	....	2	....	..	2	..	4	4
Bridgewater	....	..	....	..	..	....	....	1	....	..	1	..	1	1
Canaan	1	1	....	2	..	....	....	..	....	..	..	2	..	2
Colebrook	....	1	....	1	..	....	....	3	....	3	..	4	..	4
Cornwall	....	..	....	..	..	....	....	2	....	1	1	1	1	2
Goshen	1	..	....	..	1	....	....	..	....	..	..	..	1	1
Harwinton	....	..	....	..	..	....	....	..	....	..	..	..	..	....
Kent	1	1	....	..	2	....	....	1	....	..	1	..	3	3
Morris	....	1	....	1	..	1	....	5	....	3	3	4	3	7
New Hartford	2	1	....	1	2	1	....	7	....	4	4	5	6	11
New Milford	3	1	2	3	3	....	....	5	....	3	2	6	5	11
Norfolk	1	..	....	1	..	....	....	5	....	3	2	4	2	6
North Canaan	2	1	....	1	2	....	....	1	....	..	1	1	3	4
Plymouth	1	1	....	1	1	....	....	3	....	1	2	2	3	5
Roxbury	....	..	....	..	..	....	....	5	....	2	3	2	3	5
Salisbury	....	3	1	..	4	....	....	8	1	3	6	3	10	13
Sharon	1	..	....	1	..	....	....	2	....	1	1	2	1	3
Thomaston	....	1	....	..	1	....	1	3	1	1	4	1	5	6
Torrington	1	..	....	1	..	1	....	3	3	4	3	5	3	8
Warren	....	1	....	1	..	....	....	..	....	..	..	1	..	1
Washington	....	1	....	..	1	....	1	3	....	2	2	2	3	5
Waterbury	1	1	1	1	2	....	....	4	....	..	4	1	6	7
Winchester	4	..	....	3	1	....	....	15	....	6	9	9	10	19
Woodbury	2	1	....	1	2	....	1	3	....	3	1	4	3	7
Totals	23	19	5	20	27	3	3	83	5	40	54	60	81	141

CLASS III.—LOCAL DISEASES.

Towns in Litchfield Co.	Order 1.—Nervous System. Apoplexy.	Paralysis.	Insanity.	Epilepsy.	Tetanus.	Convulsions.	Brain Disease.	Spinal Disease.	Meningitis.	Total. M.	Total. F.	Order 2.—Circulation. Pericarditis.	Aneurism.	Heart Disease.	Embolism.	Total. M.	Total. F.	Order 3.—Respiratory System. Bronchitis.	Pleurisy.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
Litchfield	2	..	....	..	....	..	..	....	....	1	1	..	....	2	....	2	..	1	....	4	....	..	1	4
Barkhamsted	1	1	....	..	....	..	..	....	....	..	2	..	....	1	....	1	..	1	....	5	....	..	3	3
Bethlehem	..	..	....	..	....	..	1	....	....	1	..	..	....	..	....	....	..	....	....	1	....	..	1	..
Bridgewater	..	..	....	..	....	..	..	....	....	..	..	..	....	2	....	1	1	....	....	..	....	..	..	..
Canaan	1	..	....	..	....	..	..	....	....	..	1	..	1	1	....	2	..	....	....	3	....	..	2	1
Colebrook	2	1	....	..	....	1	..	....	....	2	2	..	....	..	....	....	..	1	....	1	....	1	..	3
Cornwall	..	..	....	..	....	..	..	....	....	..	..	..	....	1	....	1	..	....	....	2	....	..	..	2
Goshen	3	..	....	..	....	..	..	....	....	2	1	..	....	2	....	....	2	....	....	1	....	..	..	1
Harwinton	..	1	....	..	....	3	..	....	....	2	2	..	....	1	....	....	1	....	....	..	....	..	..	..
Kent	..	..	....	..	....	..	..	....	....	..	..	..	....	..	....	....	..	....	....	..	....	..	..	..
Morris	..	1	....	1	....	..	..	....	....	1	1	..	....	2	....	1	1	....	....	..	....	..	..	..
New Hartford	..	5	....	1	....	4	..	....	2	5	7	..	....	8	....	5	3	....	....	7	....	1	3	5
New Milford	2	5	....	1	1	..	2	....	1	7	5	..	....	1	....	1	..	1	....	2	....	..	2	1
Norfolk	..	1	....	3	....	1	..	....	....	3	2	..	....	..	....	....	..	....	....	2	....	3	3	2
North Canaan	..	2	....	..	....	..	..	....	....	..	2	..	....	1	....	....	1	....	....	1	....	..	..	1
Plymouth	1	..	1	..	....	..	2	....	....	3	1	..	....	1	....	1	.	....	....	1	....	..	1	..
Roxbury	..	..	....	..	....	..	..	....	....	..	..	..	....	..	....	....	..	....	....	..	....	..	..	..
Salisbury	3	4	....	..	....	2	..	....	....	5	4	..	....	2	....	2	..	....	....	5	....	5	5	5
Sharon	..	1	....	..	....	..	1	....	....	1	1	..	....	..	....	....	..	....	....	2	....	2	2	2
Thomaston	1	..	....	1	....	2	1	....	3	5	3	..	....	..	....	....	..	....	....	3	....	1	2	2
Torrington	2	1	....	..	....	..	..	....	....	3	..	1	....	4	1	3	3	....	1	2	1	..	3	1
Warren	2	..	....	..	....	..	..	....	....	2	1	..	....	..	....	....	..	....	....	2	....	.	1	1
Washington	5	..	....	..	1	1	..	1	....	5	2	..	1	2	....	3	..	....	....	4	....	1	2	3
Waterbury	..	1	....	..	....	2	3	....	....	3	3	..	....	..	1	....	1	....	....	1	....	..	1	..
Winchester	1	6	....	..	....	1	1	....	....	3	6	..	....	2	....	....	2	....	3	5	....	..	6	2
Woodbury	5	..	2	..	....	..	3	....	....	4	6	..	....	..	....	....	..	....	....	1	....	1	1	1
Totals	31	30	3	7	2	17	14	1	6	58	53	1	2	33	2	24	15	4	4	55	1	15	39	40

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Litchfield Co.	Order 4.—Digestive Organs.										Order 5.—Urinary Organs.								Orders 6, 7, 8.					Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Stomach Disease.	Jaundice.	Liver Disease.	Total. M.	Total. F.	Bright's Disease.	Diabetes.	Calculus.	Cystitis.	Kidney Disease.	Uræmia.	Total. M.	Total. F.	Disease of Uterus.	Joint Disease. M.	Joint Disease. F.	Phlegmon. M.	Phlegmon. F.	Males.	Females.	Total.
LITCHFIELD	...	...	...	...	...	...	1	1	2	...	1	1	...	...	1	..	2	1	...	...	...	...	...	8	6	14
Barkhamsted	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	4	5	9
Bethlehem	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	2	...	2
Bridgewater	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	..	1	...	...	...	...	...	...	2	1	3
Canaan	...	...	...	...	...	...	...	...	...	...	2	...	...	1	...	..	3	...	...	...	...	...	...	7	2	9
Colebrook	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	2	5	7
Cornwall	...	...	1	...	...	...	...	...	1	...	...	...	...	...	...	..	...	...	...	...	...	...	...	2	2	4
Goshen	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	2	4	6
Harwinton	...	...	1	...	...	...	...	3	3	1	...	...	...	...	...	..	...	...	...	...	...	...	...	5	4	9
Kent	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
Morris	...	1	1	...	...	1	...	...	1	2	...	...	...	...	...	..	...	...	...	...	...	...	...	3	4	7
New Hartford	...	...	1	...	1	...	...	...	...	2	...	...	...	...	...	..	...	...	...	...	...	...	...	13	17	30
New Milford	1	...	...	...	...	1	2	...	2	2	1	1	...	...	...	1	2	1	...	...	...	...	...	14	9	23
Norfolk	1	...	...	...	...	...	...	...	...	1	...	...	...	...	...	..	...	...	...	...	...	...	...	6	5	11
North Canaan	...	...	2	...	...	...	...	1	2	1	1	...	...	...	...	..	1	...	...	...	...	...	...	3	5	8
Plymouth	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	..	2	...	1	...	...	...	...	7	2	9
Roxbury	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	..	...	...	...	...	...	...	...	1	...	1
Salisbury	1	...	...	3	...	...	...	...	2	2	3	...	...	...	...	..	2	1	...	...	...	...	...	16	12	28
Sharon	...	...	1	...	...	...	...	...	...	1	1	...	...	...	...	..	1	...	...	...	...	...	...	4	4	8
Thomaston	1	...	1	...	...	...	...	...	1	1	...	...	...	...	...	..	...	...	...	...	...	...	...	8	6	14
Torrington	...	...	1	1	1	...	...	2	2	3	1	...	...	...	...		1	...	...	...	...	...	...	12	7	19
Warren	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	3	2	5
Washington	...	...	...	...	...	...	...	1	...	1	1	...	...	...	...	..	1	...	...	...	...	...	...	11	6	17
Watertown	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	..	...	...	...	...	1	...	...	5	5	10
Winchester	...	...	1	1	...	2	...	...	1	3	...	...	...	...	2	.	2	...	...	...	...	...	...	12	13	25
Woodbury	1	...	1	1	...	1	...	...	3	1	1	...	...	...	...	..	1	...	...	...	...	1	...	10	8	18
Totals	5	1	11	6	2	6	3	9	22	21	13	2	1	1	4	1	19	3	1	...	1	1	...	162	134	296

Towns in Litchfield Co.	Class IV.—Developmental Diseases.														Class V.—Violent Deaths.																	Grand Total for All Classes.			
	Order 1.—Of Children.						Orders 2, 3, and 4.								Order 1.—Accident and Negligence.							Order 3.—Homicide.	Order 4.—Suicide.		Orders 5 and 6.										
	Stillborn.	Premature Birth.	Cyanosis.	Teething.	Total.		Childbirth.	Old Age.		Atrophy and Debility.		Total for Class IV.			Fractures.	Wounds.	Burns and Scalds.	Drowning.	Otherwise.	Total.					Sudden.	Cause not reported.	Total.		Total for Class V.			Males.	Females.	Sex not Stated.	Total.
					M.	F.		M.	F.	M.	F.	Male.	Female.	Total.						M.	F.	F.	M.	F.			M.	F.	Male.	Female.	Total.				
Litchfield		2			2			3				5		5	1	1					2			1	1		1		1	3	4	18	15		33
Barkhamstead										1	1	1	1	2																		6	9		15
Bethlehem	1					1		1	1			1	2	3																		3	7		10
Bridgewater	1				1				1			1	1	2																		3	3		6
Canaan		1			1			1				2		2																		12	5		17
Colebrook		3			2	1		1	3			3	4	7												3	3		3		3	14	10		24
Cornwall								2				2		2												1		1		1	1	6	6		12
Goshen	1				1			3	1			4	1	5		1	1			2									2		2	9	8		17
Harwinton								1	2			1	2	3					1		1					1		1		2	2	6	10		16
Kent																																2	6		8
Morris									2				2	2	1					1									1		1	8	9		17
New Hartford		2			2			1	1			1	3	4																		22	29		51
New Milford	2			1	2	1		2	4	1		5	5	10		1			1		2		1			2		2	1	4	5	34	25		59
Norfolk									2				2	2				1		1						2	2		3		3	14	10		24
North Canaan								1	1			1	1	2												1		1		1	1	9	11		20
Plymouth		2				2			3				5	5									1						1		1	10	11		21
Roxbury				1		1			1				2	2																		4	6		10
Salisbury		1				1			1				2	2					3		3									3	3	26	13		59
Sharon								1	2			1	2	3												8	3	5	3	5	8	10	14		24
Thomaston		1	2		1	2	1					1	3	4																		11	15		26
Torrington				1																			1			1		1	1	1	2	24	18		42
Warren																																5	2		7
Washington		1	1			2		1	1			1	3	4								1	1			1		1	1	2	3	16	18		34
Watertown	4				3	1		1	2	1	1	5	4	9																		12	15		27
Winchester							1	1	5			1	6	7	3				1		4		1						1	4	5	32	42		74
Woodbury									1				1	1					1		1		1			3	3		4	1	5	20	14		34
Totals	9	13	3	2	10	12	2	20	34	3	2	36	52	88	5	3	1	1	7	4	13	1	6	1	1	23	12	12	22	27	49	336	351	....	687

TABLE.

CAUSES OF DEATHS, ARRANGED BY TOWNS.

Towns in Middlesex Co.	CLASS I.—ZYMOTIC DISEASES.																																				
	Order I.—Miasmatic.																							Order II.—Enthetic.					Order III.—Dietic.						Total for Class I.		
	Scarlet Fever.	Diphtheria.	Quinsy.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Carbuncle.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Typho-Malarial Fever.	Congestive Fever.	Rheumatism.	Measles.	Remittent Fever.	Small-pox.	Cholera.	Influenza.	Total. M.	Total. F.	Syphilis.	Strict're of Urethra.	Hydrophobia.	Total. M.	Total. F.	Thrush.	Alcholism.	Privation.	Purpura.	Total. M.	Total. F.	Male.	Female.	Total.
Middletown	9	7		5	1	2	1				3	8		2		2						22	18												22	18	40
Haddam					2		1						1									2	2												2	2	4
Chatham			1			1						1											3													3	3
Chester		1																					1													1	1
Clinton					3					1		1		2								4	3												4	3	7
Cromwell	3			1												3						5	2												5	2	7
Durham												1										1								1			1		2		2
East Haddam		1		1	1							3	1									6	1												6	1	7
Essex	3				1		1															1	4												1	4	5
Killingworth	4					1		1	1														7													7	7
Middlefield	1			1																		1	1												1	1	2
Old Saybrook	3											1	1									2	3												2	3	5
Portland	10	1		7	1					2		5		1	1							12	16												12	16	28
Saybrook												1										1													1		1
Westbrook						1																	1													1	1
Totals	33	10	1	15	9	5	3	1	1	3	3	21	3	5	1	5						57	62							1			1		58	62	120

Towns in Middlesex County.	CLASS II—CONSTITUTIONAL. Order 1.—Diethetic. Dropsy and Anæmia.	Cancer.	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Phthisis.	Tabes Mesenterica.	Hydrocephalus.	Total. M.	Total. F.	Total for Class II. Males.	Females.	Total.
Middletown	2	5	..	3	4	2	25	1	3	13	18	16	22	38
Haddam	....	1	..	..	1	..	3	....	..	1	2	1	3	4
Chatham	2	3	..	2	3	..	2	....	..	..	2	2	5	7
Chester	....	2	..	1	1	..	5	....	..	3	2	4	3	7
Clinton	....	..	2	1	1	..	7	....	..	3	4	4	5	9
Cromwell	....	..	..	..	..	..	..	....	1	..	1	..	1	1
Durham	....	2	..	..	2	..	2	....	..	1	1	1	3	4
East Haddam	....	..	..	..	..	..	7	....	..	2	5	2	5	7
Essex	3	1	..	1	3	..	1	....	..	..	1	1	4	5
Killingworth	....	1	..	1	..	..	2	....	..	1	1	2	1	3
Middlefield	....	2	..	..	2	..	2	....	.	2	..	2	2	4
Old Saybrook	....	..	1	1	..	..	1	1	..	..	2	1	2	3
Portland	5	2	..	4	3	..	20	....	..	11	9	15	12	27
Saybrook	....	..	..	..	..	..	4	....	..	..	4	..	4	4
Westbrook	2	.	..	1	1	..	2	....	..	1	1	2	2	4
Totals	14	19	3	15	21	2	83	2	4	38	53	53	74	127

Towns in Middlesex County.	CLASS III—LOCAL DISEASES. Order 1.—Nervous System. Apoplexy.	Paralysis.	Insanity.	Epilepsy.	Convulsions.	Brain Disease.	Spinal Disease.	Meningitis.	Total. M.	Total. F.	Order 2.—Organs of Circulation. Pericarditis.	Heart Disease.	Embolism.	Total. M.	Total. F.	Order 3.—Respiratory System. Laryngitis.	Bronchitis.	Pneumonia.	Asthma.	Lung Disease.	Total. M.	Total. F.
Middletown	4	10	3	..	1	5	1	2	13	13	1	14	1	7	9	..	5	8	....	....	7	6
Haddam	2	1	..	..	..	.	..	..	2	1	..	3	..	1	2	..	..	1	....	1	1	1
Chatham	..	1	1	..	..	..	..	..	2	..	.	1	..	..	1	..	..	2	....	1	2	1
Chester	1	1	..	..	1	..	..	..	1	2	..	1	..	1	..	..	1	3	2	....	2	4
Clinton	1	..	..	..	1	2	..	2	2	4	..	3	..	1	2	..	1	4	....	1	2	4
Cromwell	..	..	..	1	..	..	..	..	1	..	..	2	..	2	..	..	..	..	....	...	....	....
Durham	..	..	..	..	..	..	..	1	1	..	..	4	.	..	4	..	..	1	....	....	1	....
East Haddam	3	1	..	1	1	2	..	..	6	2	..	2	..	1	1	..	2	2	....	....	2	2
Essex	1	1	..	..	1	1	..	1	..	5	..	1	..	1	..	..	..	1	....	....	1	....
Killingworth	..	1	..	..	1	..	..	..	1	1	..	1	..	..	1	..	1	1	....	1	1	2
Middlefield	1	1	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	1	....	....	1	....
Old Saybrook	2	..	..	..	1	1	.	..	1	3	..	..	..	..	..	..	..	..	....	3	2	1
Portland	2	..	..	..	1	6	..	..	2	7	..	3	..	2	1	..	..	5	1	....	4	2
Saybrook	..	..	1	..	1	1	..	..	3	..	..	1	..	..	1	1	..	1	....	....	1	1
Westbrook	..	1	..	..	..	..	..	..	..	1	..	1	..	1	..	..	..	1	....	....	1	...
Totals	17	18	5	2	9	18	1	6	36	40	1	37	1	17	22	1	10	31	3	7	28	24

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Middlesex Co.	Order 4.—Digestive Organs.											Order 5.—Urinary Organs.								Order 6.—Generative Organs.			Order 8—Integ'm'y System.		Total for Class III.		
	Gastritis.	Enteritis.	Peritonitis.	Ascites.	Ulceration of Intestines.	Stomach Disease.	Colic.	Hepatitis.	Liver Disease.	Total. M.	Total. F.	Prostatitis.	Bright's Disease.	Diabetes.	Kidney Disease.	Calculus.	Uræmia.	Total. M.	Total. F.	Ovarian Dropsy.	Disease of Uterus.	Total.	Phlegmon. M.	Phlegmon. F.	Male.	Female.	Total.
Middletown	1	2	2	1		3	1		4	3	11		2	2		1		3	2		1	1		1	33	43	76
Haddam															1				1						4	5	9
Chatham												1						1							5	2	7
Chester			1							1															5	6	11
Clinton				1					1		2									1		1			5	13	18
Cromwell			1			1	1			1	2				1			1							5	2	7
Durham												1						1							3	4	7
East Haddam			1		2				1	1	3														10	8	18
Essex	1		1					1		2	1		1		1			1	1						5	7	12
Killingworth															1			1							3	4	7
Middlefield	1									1															3	1	4
Old Saybrook			1								1		1						1						3	6	9
Portland			1								1						1		1						8	12	20
Saybrook								1			1														4	3	7
Westbrook		1	1							1	1														3	2	5
Totals	3	3	9	2	2	4	2	2	6	10	23	2	4	2	4	1	1	8	6	1	1	2	....	1	99	118	217

Towns in Middlesex Co.	Class IV.—Developmental Diseases. Order 1.—Of Children. Stillborn.	Premature Birth.	Spina Bifida.	Other Malformations.	Total. M.	Total. F.	Order 2.—Of Women. Childbirth.	Order 3—Of Old People. Old Age. M.	Old Age. F.	Order 4—Nutrit'n. Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Male.	Female.	Total.
Middletown	5	3	1	....	2	7	1	3	8	1	4	7	20	27
Haddam	3	..	....	....	3	..	....	...	....	....	....	3	....	3
Chatham	1	..	....	....	1	..	....	....	4	....	1	1	5	6
Chester	1	..	....	...	1	..	....	2	....	....	....	3	....	3
Clinton	..	..	....	....	..	..	....	2	1	1	....	3	1	4
Cromwell	..	1	....	....	..	1	....	2	....	....	....	2	1	3
Durham	..	1	....	....	1	..	....	1	1	....	....	2	1	3
East Haddam	..	..	....	....	..	..	1	2	2	....	....	2	3	5
Essex	..	..	....	1	..	1	....	....	....	1	1	1	2	3
Killingworth	..	..	..	1	1	..	....	3	2	....	....	4	2	6
Middlefield	..	..	....	....	..	..	....	....	....	....	....	....	....	....
Old Saybrook	..	..	....	....	..	.	1	1	....	1	....	2	1	3
Portland	..	2	....	....	1	1	2	....	2	2	....	2	5	7
Saybrook	..	..	....	....	..	..	....	....	....	....	....	....	....	....
Westbrook	..	.	....	....	..	..	....	....	....	....	....	....	....	....
Totals	10	7	1	2	10	10	5	16	20	6	6	32	41	73

Towns in Middlesex Co.	Class V.—Violent Deaths. Order 1.—Accident and Negligence. Fractures.	Burns and Scalds.	Poison.	Drowning.	Otherwise.	Total. M.	Total. F.	Order 4.—Suicide. Drowning.	Otherwise.	Total. M.	Total. F.	Orders 5 & 6. Sudden.	Cause not reported.	Total. M.	Total. F.	Total for Class V. Male.	Female.	Total.	Grand Total for All Classes. Male.	Female.	Total.
Middletown	4	1	....	4	1	9	1	....	..	....	....	....	1	..	1	9	2	11	86	106	192
Haddam	1	....	....	..	..	1	....	....	....	....	....	....	6	4	2	5	2	7	15	12	27
Chatham	..	....	....	..	..	....	....	....	....	....	....	....	..	..	..	..	..	..	8	15	23
Chester	..	....	....	..	..	....	....	....	....	....	....	....	..	..	..	..	..	..	12	10	22
Clinton	..	1	....	1	..	1	1	....	1	....	1	....	1	1	..	2	2	4	18	24	42
Cromwell	1	....	....	..	..	....	1	....	....	....	....	....	1	1	..	1	1	2	13	7	20
Durham	1	....	....	..	..	....	1	....	....	....	....	....	..	..	..	..	1	1	8	9	17
East Haddam	1	....	....	..	..	....	1	....	....	....	....	2	2	2	2	2	3	5	22	20	42
Essex	1	....	....	..	1	2	....	....	....	....	....	....	1	..	1	2	1	3	10	18	28
Killingworth	..	....	....	..	1	1	....	....	....	....	....	....	..	..	..	1	..	1	10	14	24
Middlefield	..	....	....	..	..	....	....	....	....	....	....	....	..	..	..	..	..	..	6	4	10
Old Saybrook	..	....	....	..	..	....	....	....	....	....	....	....	2	..	2	..	2	2	8	14	22
Portland	..	....	1	..	1	2	...	1	....	1	....	...	3	..	3	3	3	6	41	48	89
Saybrook	..	....	....	..	..	....	....	....	....	....	....	....	..	..	..	..	..	..	5	7	12
Westbrook	..	....	....	..	..	....	....	....	....	....	....	1	3	1	3	1	3	4	6	8	14
Totals	9	2	1	5	4	16	5	1	1	1	1	3	20	9	14	26	20	46	268	316	584

TABLE.

CAUSES OF DEATHS, ARRANGED BY TOWNS.

Towns in Tolland Co.	CLASS I.—ZYMOTIC DISEASES.																																	
	Order 1.—Miasmatic.																				Order 2.—Enthetic.				Order 3.—Dietic.						Total for Class 1.		
	Measles.	Scarlet Fever.	Diphtheria.	Croup.	Whooping Cough.	Typhoid Fever.	Erysipelas.	Puerperal Fever.	Carbuncle.	Pyaemia.	Dysentery.	Diarrhea.	Cholera Infantum.	Intermittent Fever.	Congestive Fever.	Typho-Malarial Fever.	Remittent Fever.	Rheumatism.	Cerebro-Spinal Meningitis.	Total. M.	Total. F.	Syphilis.	Hydrophobia.	Total. M.	Total. F.	Privation.	Purpura.	Alcoholism.	Thrush.	Total. F.	Total. M.	Male.	Female.	Total.
Tolland							1														1							1			1		2	2
Andover																																		
Bolton																																		
Columbia																																		
Coventry		2											1							1	2											1	2	3
Ellington											1	1	1			1				2	2							1		1		3	2	5
Hebron						1	1													2												2		2
Mansfield			3			1															4												4	4
Somers								1													1												1	1
Stafford			1		1	2												2		2	4											2	4	6
Union						2							1							2	1											2	1	3
Vernon			2			4					1	1	7			1	1	1	2	6	14								1	1		7	14	21
Willington						1															1												1	1
Totals		2	6		1	11	2	1			2	2	10			2	1	3	2	15	30							2	1	2	1	17	31	48

Towns in Tolland County.	CLASS II.—CONSTITUTIONAL. Order 1.—Diethetic. Dropsy and Anæmia.	Cancer	Mortification.	Total. M.	Total. F.	Order 2.—Tubercular. Scrofula.	Tabes Mesenterica.	Phthisis.	Hydrocephalus.	Total. M.	Total. F.	Total for Class II. Males.	Females.	Total.
TOLLAND	....	2	1	..	3	..	....	3	..	1	2	1	5	6
Andover	....	..	..	..	..	..	....	..	..	..	..	..	..	...
Bolton	....	..	..	..	..	..	....	..	..	..	..	..	..	...
Columbia	....	1	..	..	1	..	....	2	..	..	2	..	3	3
Coventry	....	2	..	1	1	..	....	11	..	2	9	3	10	13
Ellington	....	1	..	1	..	..	....	4	..	1	3	2	3	5
Hebron	....	..	..	..	..	..	....	6	1	5	2	5	2	7
Mansfield	....	1	..	..	1	1	...	4	..	3	2	3	3	6
Somers	1	..	..	..	1	..	....	1	..	1	..	1	1	2
Stafford	....	..	..	..	..	..	....	7	1	3	5	3	5	8
Union	....	..	..	..	..	..	....	1	..	..	1	..	1	1
Vernon	....	1	..	..	1	..	2	17	1	7	13	7	14	21
Willington	2	2	..	..	4	..	....	..	..	..	..	..	4	4
Totals	3	10	1	2	12	1	2	56	3	23	39	25	51	76

Towns in Tolland County.	CLASS III.—LOCAL DISEASE. Order 1.—Nervous System. Apoplexy.	Paralysis.	Convulsions.	Brain Disease.	Meningitis.	Spinal Disease.	Total. M.	Total. F.	Order 2.—of Organs. Cir'lation. Aneurism.	Heart Disease.	Pericarditis.	Total. M.	Total. F.	Order 3.—Respiratory System. Bronchitis.	Pleurisy.	Pneumonia.	Lung Disease.	Total. M.	Total. F.
TOLLAND	2	2	..	1	....	....	1	4	..	1	1	1	1	....	....	2	1	1	2
Andover	..	..	..	..	....	....	..	..	.	..	..	..	..	....	....	....	1	1	....
Bolton	..	..	..	..	....	....	..	..	..	..	..	..	..	....	....	1	2	....	3
Columbia	1	..	..	..	....	....	..	1	..	1	..	1	..	....	....	1	..	1	....
Coventry	1	..	..	1	....	....	..	2	..	..	2	..	2	4	....	3	....	2	5
Ellington	2	..	..	..	....	....	..	2	..	..	..	..	..	....	....	3	1	3	1
Hebron	3	..	..	1	....	....	1	3	..	..	..	..	..	....	....	....	....	....	....
Mansfield	1	..	..	1	....	....	1	1	..	1	..	..	1	3	....	3	1	1	6
Somers	1	1	1	..	1	....	2	2	1	1	..	1	1	....	....	5	....	2	3
Stafford	1	3	..	..	....	....	..	4	..	2	..	..	2	....	....	4	1	2	3
Union	..	..	..	..	....	....	..	..	..	1	..	1	..	....	....	....	....	....	....
Vernon	1	1	3	1	1	....	3	4	..	1	1	2	..	....	1	5	2	6	2
Willington	..	..	..	..	....	....	..	..	..	..	..	..	..	....	....	....	2	....	2
Totals	13	7	4	5	2	....	8	23	1	8	4	6	7	7	1	27	11	19	27

CLASS III.—LOCAL DISEASES—Concluded.

Towns in Tolland Co.	Order 4.—Digestive Organs. Gastritis.	Enteritis.	Peritonitis.	Ulceration of Intestines.	Hernia.	Stomach Disease.	Hepatitis.	Liver Disease.	Spleen Disease.	Total. M.	Total. F.	Order 5.—Urinary Organs. Bright's Disease.	Diabetes.	Cystitis.	Prostatitis.	Kidney Disease.	Total. M.	Total. F.	Order 6.—Gen'ative Organs. Ovarian Dropsy.	Disease of Uterus.	Total. F.	Order 7.—Organs of Locomotion. Joint Disease.	Necrosis and Caries.	Total. M.	Total. F.	Order 8.—Integumentary System. Tumor.	Phlegmon.	Ulcer.	Skin Disease.	Total. M.	Total. F.	Total for Class III. Males.	Females.	Total.
Tolland									1	1														1								5	7	12
Andover													1				1															2		2
Bolton			1								1																						4	4
Columbia					1					1																						3	1	4
Coventry	1			2				1			4																					2	13	15
Ellington																			1		1											3	4	7
Hebron												1					1															2	3	5
Mansfield												1					1										1				1	3	9	12
Somers	1		1							1	1																					6	7	13
Stafford	1							3		2	2			1			1															5	11	16
Union																																1		1
Vernon	1	3	1			3	1	3		4	8	2					2															17	14	31
Willington			1								1	1					1			1	1						1	1		1	1	2	5	7
Totals	4	3	4	2	1	3	1	7	1	9	17	5	1	1			7		1	1	2			1			2	1		1	2	51	78	129

Towns in Tolland Co.	Class IV.—Developmental Diseases. Order 1.—Of Children. Stillborn.	Premature Birth and Infantile Debility.	Cyanosis.	Malformation.	Teething.	Total. M.	Total. F.	Orders 2, 3, and 4. Childbirth.	Old Age. M.	Old Age. F.	Atrophy and Debility. M.	Atrophy and Debility. F.	Total for Class IV. Male.	Female.	Total.	Class V.—Violent Deaths. Order 1.—Accident or Negligence. Fractures.	Poison.	Burns and Scalds.	Drowning.	Wounds.	Suffocation.	Otherwise.	Total. M.	Total. F.	Orders 3, 4, 5, and 6. Homicide. M.	Drowning.	Otherwise.	Total. M.	Total. F.	Cause not reported. M.	Cause not reported. F.	Total for Class V. Males.	Females.	Total.	Grand Total for All Classes. Males.	Females.	Sex not Stated.	Total.
Tolland										1				1	1					1			1							1		2		2	8	15		23
Andover																	1							1							1		2	2	2	2		4
Bolton																																				4		4
Columbia										1				1	1	1		1					1	1							1	1	2	3	4	7		11
Coventry	2	1				2	1		1				3	1	4												1		1		1		2	2	9	28		37
Ellington	2		1			2	1						2	1	3																				10	10		20
Hebron								1						1	1																				9	6		15
Mansfield										1				1	1					1			1									1		1	7	17		24
Somers										1		1		2	2	1							1							1		2		2	9	11		20
Stafford		2				2			3				5		5	1							1			2		1	1			2	1	3	17	21	11	49
Union								1		1				2	2																				3	4		7
Vernon	3	6		2	3	7	7	2	1	3			8	12	20			1	1			4	3	4	1	1		1				5	4	9	44	58		102
Willington	1	4			1	2	4		1	4			3	8	11						1	1			1							4	10	14	6	18		24
Totals	8	13	1	2	4	15	13	4	6	12		1	21	30	51	3	1	2	1	2	1	5	8	6	2	3	1	2	2	2	3	17	21	38	128	201	11	340

Recapitulation of Table 4.

CAUSES OF DEATH.	Hartford Co.	New Haven Co.	New London Co.	Fairfield Co.	Windham Co.	Litchfield Co.	Middlesex Co.	Tolland Co.	TOTAL.	PER CENT. TO TOTAL MORTALITY.		
										1879.	1878.	1877.
ZYMOTIC DISEASES.												
Order 1, Miasmatic	380	418	229	335	118	107	119	45	1751	18.59	22.51	25.49
" 2, Enthetic	5	1	3	1	....	1	....	....	11	.11	.22	.19
" 3, Dietic	9	12	4	6	....	4	1	3	39	.41	.37	.46
Total, Class I	394	431	236	342	118	112	120	48	1801	19.13	23.10	26.14
CONSTITUTIONAL DISEASES.												
Order 1, Diathetic	61	71	55	82	21	47	36	14	387	4.11	4.49	4.34
" 2, Tubercular	287	388	192	231	103	94	91	62	1448	15.16	15.90	17.03
Total, Class II	348	459	247	313	124	141	127	76	1835	19.49	20.39	21.37
LOCAL DISEASES.												
Order 1, Nervous System	255	325	183	197	73	111	76	31	1251	13.29	13.09	12.75
" 2, Organs of Circulation	108	99	67	80	41	39	39	13	486	5.16	4.87	4.92
" 3, Organs of Respiration	181	274	97	160	82	79	52	46	971	10.31	7.34	8.78
" 4, Organs of Digestion	89	131	53	70	39	43	33	26	484	5.14	3.67	4.24
" 5, Urinary Organs	59	62	33	32	13	22	14	7	242	2.50	2.28	2.05
" 6, Generative Organs	5	14	5	8	2	1	2	2	39	.41	.22	.39
" 7, Organs of Locomotion	....	10	4	3	....	1	....	1	19	.20	.12	.32
" 8, Integumentary System	3	10	3	3	1	1	1	3	25	.26	.24	.54
Total, Class III	700	925	445	553	251	296	217	127	3516	37.34	31.83	33.98
DEVELOPMENTAL DISEASES.												
Order 1, Of Children	96	229	69	71	64	27	20	27	603	6.40	5.77	6.07
" 2, Of Women	15	12	3	16	7	2	5	4	64	.68	.64	.81
" 3, Of Old People	91	95	94	100	35	54	36	18	524	5.56	5.78	3.23
" 4, Of Nutrition	12	53	27	31	4	5	12	1	145	1.54	1.36	2.41
Total, Class IV	214	389	193	218	110	88	73	51	1336	14.15	13.55	14.52
VIOLENT DEATHS.												
Order 1, Accident	78	75	36	48	19	17	21	14	307	3.26	3.76	3.10
" 3, Homicide	1	2		1		1	....	2	7	.07	.13	.11
" 4, Suicide	10	16	5	15	7	7	2	4	66	.70	.61	.57
" 5, Execution	....	....	....	1	....	....	....	....	1	.01	......	......
Sudden, Cause unascertained	5	7	2	14	1	1	3	....	33	.35	.37	.21
Sex and Cause not stated	104	70	105	64	89	23	20	16	512	5.43	6.27	......
Total, Class V	198	170	148	143	116	49	46	36	926	9 83	11.13	......
Grand Total	1854	2372	1269	1569	719	687	584	340	9394	100.00	100.00	100.00

TABLE 5.

DEATHS IN TOWNS. ALPHABETICAL ARRANGEMENT, DISTINGUISHED BY NATIONALITY, AGE, AND SEASON.

NAME OF TOWN.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Unknown.	Birthplace, Connecticut.	All Other States.	Birthplace, Ireland.	Birthplace, Germany.	Birthplace, England.	Birthplace, Sweden.	Other Foreign Countries.	Unknown.	Deaths in Spring.	Deaths in Summer.	Deaths in Fall.	Deaths in Winter.	Total.
Andover								1	1	2					4								1	1		2	4
Ashford	1	2	3		4	2	2	1	5	2					18	3	1						4	4	9	5	22
Avon	2			1		1		1	1	4	5				14			1					4	1	3	7	15
Barkhamstead		1	1					1	5	4	3				13	1			1				7	1	3	4	15
Beacon Falls	1	3			1	1	1	1							4	1	1	1			1		3	1	1	3	8
Berlin	8	7	2	4		1	2	2	4	4	2	7			35	5	3						17	5	10	11	43
Bethany	2						1		3	2		2			10								2	2	2	4	10
Bethel	7	1	1	1	1	7	4	3	2	2	3	1			26	5	2						7	5	13	8	33
Bethlehem	1				1			1	2	3	1	1			9	1							3	2	4	1	10
Bloomfield	3			1	1				6	2	2				11	1						3	3	2	6	4	15
Bolton		1							1	2					3	1								1	2	1	4
Bozrah	1		1		1	2		3		4	3				13	1		1					4	3	7	1	15
Branford	6	5	2	3	2	5	4	5	7	8	4				34	4	11	1	1				10	21	8	12	51
Bridgeport	98	86	33	16	36	39	36	18	43	27	16	4			292	64	59	16	6			15	82	139	129	102	452
Bridgewater	1							2		2	1				6								2	3		1	6
Bristol	4	5	2	6	9	7	2	8	9	10	6	3			56	3	12						17	15	16	23	71
Brookfield	2			1					3	7	1				12	2							4	6	2	2	14
Brooklyn	15	1	1	1	1	2			1	2	2	2			26	1					1		7	10	6	5	28
Burlington	1	3	1		1	1	1			1		2			8			2				1	4	4		3	11
Canaan	2	2		1			2		6	4												17	3	3	6	5	17
Canterbury	1		1		3	1	1		2	1	4				9	2	2					1	5	2	3	4	14
Canton	10	10	2	1	1	3	5	6	7	4	2				41	4	4		1		1		9	10	17	15	51
Chapin	2	1			1			1	3		2	1			11								5	2	2	2	11
Chatham	1			1	1	1	3	2	3	2	4	2	2	1	19	3	1						4	3	8	8	23
Cheshire	2	2	1	1	3	2	1	1	5	8	9	1			27	2	3		3		1		7	9	15	5	36
Chester	1	3			2		4	4	1	4	1	2			15	5	2						6	2	6	8	22
Clinton	4	2			4	3	4	2	8	10	5				32						1	9	14	13	7	8	42
Colchester		3	4	5	8	4	3	7	6	2	2				31	3	6					4	17	8	7	12	44
Colebrook	5			1	3	2	1	3	2	3	3	1			8	2			3			11	8	6	3	7	24
Columbia					1	1	2		3	1	3				7	2			1			1	1	2	3	5	11
Cornwall	1	1		2	1	1		1	2	2	1				10	2							4		4	4	12
Coventry	4	3	2	1	4	3	2	4	7	6		1			27	7	2	1					10	6	6	15	37
Cromwell	1	6	1		1		1	2	3	3		2			14	2	2	2					1	9	7	3	20
Danbury	38	13	5	10	11	16	11	16	14	23	11	4	1		115	18	14	2	4			20	38	45	50	40	173
Darien	3		1			1		3	2	5	3				9	3	1					5	5	2	5	6	18
Derby	47	11	6	9	12	11	13	7	13	10	4			1	110	9	19	1	4		1	2	46	35	26	39	146
Durham	2	1			1	2		2		5	3	1			15	1	1						4	5	4	4	17
Eastford	1	1	1	1	2		2	2		4					9	5							3		5	6	14
East Granby				2						2	1	1			6								1	1	3	1	6
East Haddam		13	1	3	4	1	5	3	4	7		1			39		3						2	20	14	6	42
East Hartford	11	12	1	1	5	7	6	4	4	10	8	1			51	5	2		1		1	10	21	21	12	16	70
East Haven	5	4	1	2	1	2	1	1	2	4	1	2			23	1	1	1					8	10	4	4	26
East Lyme	8	1	3	3	1	2	4	1	5	9	4			1	30			9	3				19	12	7	4	42
Easton	1						1		4	6	3	1			15							1	1	8	1	6	16

TABLE 5.—Continued.

NAME OF TOWN.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Unknown.	Birthplace, Connecticut.	All other States.	Ireland.	Germany.	England.	Sweden.	Other Foreign Countries.	Unknown.	Deaths in Spring.	Deaths in Summer.	Deaths in Fall.	Deaths in Winter.	Total.
East Windsor...	6	4	1	6	2	2	3	3	5	6	1	..	..	...	22	5	7	2	1	..	..	2	11	6	5	17	39
Ellington........	6	1	..	1	..	1	1	1	5	4	..	..	..	...	18	...	2	..	..	..	..	..	6	4	5	5	20
Enfield...........	18	13	6	9	10	11	9	12	16	12	3	..	..	...	18	1	30	1	1	..	68	..	38	35	20	26	119
Essex............	1	2	..	4	..	4	2	2	4	6	3	..	..	...	25	2	1	..	..	..	..	..	5	8	6	9	28
Fairfield.........	9	...	10	2	1	3	..	8	7	7	4	..	..	...	35	9	7	..	..	..	..	..	18	8	10	15	51
Farmington......	2	5	1	1	1	3	..	5	3	7	6	1	..	...	21	1	2	1	2	..	..	8	6	12	10	7	35
Franklin.........	1	1	..	..	..	..	..	..	1	3	3	..	..	...	8	1	...	..	..	..	..	..	2	1	2	4	9
Glastonbury......	7	3	..	..	1	3	2	2	2	5	4	..	..	...	24	2	1	1	1	..	..	..	10	6	6	7	29
Goshen..........	1	1	..	1	1	..	1	1	3	5	3	..	..	...	12	...	5	..	..	..	..	..	5	...	7	5	17
Granby..........	1	...	1	2	4	1	..	2	3	1	1	..	..	...	14	1	1	..	..	..	..	..	5	2	5	4	16
Greenwich........	11	12	4	7	7	5	3	6	6	15	6	3	1	...	50	14	11	1	1	..	1	8	21	22	22	21	86
Griswold.........	2	9	4	3	3	2	1	1	2	..	4	..	..	...	20	6	3	.	..	..	..	2	1	11	15	4	3
Groton...........	16	12	2	4	5	5	4	6	5	12	12	..	..	1	69	11	3	1	..	..	..	..	25	20	24	15	84
Guilford..........	...	...	..	2	3	3	3	7	7	7	7	..	..	...	26	4	2	..	1	..	..	..	5	18	5	5	33
Haddam.........	7	2	..	..	..	..	3	3	7	2	3	..	..	...	26	1	...	..	..	..	..	..	6	...	11	10	2
Hamden..........	4	4	1	2	1	2	1	3	2	5	3	2	.	...	25	...	2	1	1	..	1	..	5	4	4	17	30
Hampton.........	1	1	2	1	1	1	..	1	1	..	1	..	..	...	7	2	1	..	.	..	..	..	5	...	1	4	1
Hartford.........	159	55	21	29	65	57	69	74	73	56	21	18	1	15	435	88	129	25	18	4	9	5	163	196	163	191	71
Hartland.........	...	...	..	1	1	..	..	..	1	2	..	..	..	...	3	2	...	..	..	..	..	..	1	3	...	1	
Harwinton......	2	3	..	1	..	..	..	1	1	2	5	1	..	...	16	...	...	..	..	..	..	..	3	3	3	7	1
Hebron..........	1	...	1	..	1	..	1	2	4	2	3	..	..	...	12	2	1	..	..	..	..	..	1	5	3	6	1
Huntington......	2	1	..	1	4	2	7	2	3	5	2	3	..	...	21	5	3	3	..	..	..	..	7	8	8	9	3
Kent............	1	...	..	1	3	..	1	1	1	..	..	..	..	...	6	1	...	1	..	..	..	..	3	1	1	3	
Killingly.	...	...	..	..	..	..	..	..	..	..	..	..	..	129	87	25	2	..	3	..	12	..	32	37	24	36	12
Killingworth....	1	1	3	..	3	1	2	2	1	5	5	..	..	...	24	...	...	..	..	..	..	..	2	5	10	7	2
Lebanon.........	4	...	..	2	3	1	2	..	1	6	5	..	..	...	19	3	1	1	..	..	..	..	5	6	9	4	2
Ledyard.........	2	2	.	..	6	1	..	2	6	3	6	..	..	...	26	1	...	1	..	..	..	..	5	5	9	9	2
Lisbon..........	2	1	..	..	1	..	..	3	1	..	..	..	..	...	6	1	...	..	..	..	..	1	4	1	...	3	
Litchfield........	8	1	2	1	3	2	2	5	1	4	3	1	..	...	23	1	3	..	..	..	..	6	7	7	7	12	3
Lyme...........	5	...	..	1	..	..	1	..	3	2	..	..	..	...	12	...	...	..	..	..	..	..	1	3	5	3	1
Madison.........	1	...	..	1	3	2	1	3	3	7	4	1	..	...	22	3	1	..	..	..	..	..	10	7	3	6	2
Manchester......	15	13	..	1	12	6	3	11	8	6	5	1	..	...	61	7	13	2	5	..	1	2	24	22	26	19	9
Mansfield.......	4	2	1	3	1	2	..	2	3	5	1	..	..	...	22	1	1	..	..	..	..	..	10	6	3	6	2
Marlborough....	...	...	..	..	..	..	..	3	2	3	2	..	..	...	9	1	...	..	..	..	..	..	3	2	2	3	1
Meriden.........	59	50	14	11	22	18	15	15	10	11	5	1	..	66	211	15	23	7	9	..	5	27	65	61	57	48	29
Middlebury......	...	...	1	..	..	..	..	..	3	4	2	..	..	...	10	...	...	..	..	..	..	..	3	2	1	4	1
Middlefield......	...	1	1	1	..	2	1	3	..	1	..	..	..	...	8	1	1	..	..	..	..	..	3	3	1	3	
Middletown.....	32	22	6	9	16	17	13	13	22	28	11	2	..	1	128	18	27	3	8	..	..	8	57	44	43	48	1
Milford..........	9	4	3	2	7	4	5	1	6	9	6	..	..	...	50	4	1	..	..	..	1	..	12	12	13	19	
Monroe..........	...	...	1	..	..	..	2	..	..	1	2	2	..	...	8	...	...	..	..	..	..	..	...	1	4	3	
Montville.......	4	3	..	2	2	1	3	3	2	5	7	1	..	2	33	...	2	..	..	..	..	..	6	5	13	11	
Morris..........	...	...	..	1	4	2	2	1	4	1	1	1	..	...	12	4	1	..	..	..	..	..	4	5	4	4	
Naugatuck......	9	5	2	3	4	5	2	2	8	3	3	1	..	...	37	...	7	3	..	..	..	..	16	5	7	19	
New Britain....	37	22	6	10	17	5	10	8	13	20	5	2	..	20	103	13	16	8	9	..	1	25	34	44	38	59	1
New Canaan....	5	2	1	1	3	3	2	1	2	9	2	..	..	1	18	11	...	..	..	..	3	..	9	6	5	12	
New Fairfield	...	2	2	1	2	2	..	1	..	2	3	..	..	...	13	...	2	..	..	..	..	..	4	4	2	5	
New Hartford....	9	3	1	3	6	2	4	4	7	6	6	..	..	...	35	3	8	..	..	..	..	5	13	11	9	18	
New Haven......	292	125	34	51	88	88	83	87	89	77	42	4	2	...	643	114	193	37	8	..	21	16	251	289	241	281	10
Newington......	4	1	..	..	..	..	1	..	4	2	2	1	..	...	11	2	...	1	..	..	1	..	5	4	3	3	

TABLE 5.—CONTINUED.

NAME OF TOWN.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Unknown.	Birthplace, Connecticut.	All other States.	Ireland.	Germany.	England.	Sweden.	Other Foreign Countries.	Unknown.	Deaths in Spring.	Deaths in Summer.	Deaths in Fall.	Deaths in Winter.	TOTAL.
New London	46	30	14	10	20	9	20	22	20	23	27	9	1	..	158	48	28	..	5	..	..	..	49	67	61	74	251
New Milford	7	4	2	..	3	7	3	5	10	11	4	2	..	..	29	4	7	..	1	..	..	18	20	18	12	9	59
Newtown	9	1	2	7	10	1	8	6	2	7	4	..	..	..	42	4	2	..	..	..	2	7	17	17	8	15	57
Norfolk	3	..	2	3	2	2	..	6	3	3	..	..	..	..	15	3	2	..	1	..	..	..	8	9	4	3	24
North Branford	1	2	1	..	..	2	2	..	1	4	4	..	..	..	17	..	..	..	..	..	..	..	6	1	2	8	17
North Canaan	1	..	1	4	2	1	..	2	3	4	1	..	1	..	..	..	..	..	..	..	..	20	5	5	6	4	20
North Haven	2	..	..	2	1	2	1	3	5	3	..	2	..	..	19	1	1	..	..	..	..	..	6	8	3	4	21
North Stonington	5	4	4	5	1	..	3	2	2	8	1	..	..	..	30	5	..	..	..	..	..	..	18	5	3	9	35
Norwalk	30	29	10	14	15	24	19	14	19	28	14	3	..	11	146	42	30	4	6	..	1	1	57	56	45	72	230
Norwich	88	52	9	22	29	28	18	34	35	33	25	3	1	1	253	27	60	7	11	..	15	5	105	90	78	105	378
Old Lyme	1	2	..	2	1	3	..	..	..	3	5	1	..	1	19	..	..	..	..	..	..	..	7	4	5	3	19
Old Saybrook	1	3	2	2	1	1	3	1	1	3	4	..	..	..	19	2	1	..	..	..	..	..	12	3	3	5	22
Orange	8	1	2	3	1	3	2	2	4	7	4	2	..	1	31	4	1	1	1	..	2	..	11	19	6	4	40
Oxford	5	..	1	..	1	2	3	..	4	1	7	2	..	1	25	..	1	..	..	..	..	1	10	6	6	5	27
Plainfield	15	5	.	4	11	3	3	4	5	11	2	..	..	..	42	10	1	..	2	..	8	..	15	14	16	18	63
Plainville	1	2	2	..	3	1	..	2	1	..	2	..	..	..	12	..	2	..	..	..	..	..	8	2	3	1	14
Plymouth	3	..	2	2	1	3	3	2	1	4	..	..	..	..	17	..	2	2	..	..	..	..	9	4	2	6	21
Pomfret	3	3	..	3	..	1	1	4	2	9	1	1	..	..	22	4	2	..	..	..	..	..	9	8	6	5	28
Portland	23	12	8	2	10	5	4	10	8	6	1	..	..	..	66	1	18	..	..	..	..	..	20	22	17	29	89
Preston	5	3	2	2	3	..	2	3	5	2	6	1	..	..	20	4	..	..	1	3	..	10	11	5	7	11	34
Prospect	1	..	..	1	..	1	2	..	5	1	1	..	..	..	10	2	..	..	..	..	..	..	3	2	3	4	12
Putnam	34	8	3	14	12	7	2	6	5	2	6	2	..	..	63	8	4	..	1	..	16	9	27	23	21	30	101
Redding	2	2	1	1	3	1	3	3	1	4	5	..	..	..	23	2	1	..	..	..	..	..	8	4	6	8	26
Ridgefield	4	..	1	..	2	3	1	3	2	7	7	..	..	..	26	3	..	..	1	..	..	..	7	5	9	9	30
Rocky Hill	.	2	..	..	2	1	..	1	1	1	4	..	..	..	9	..	3	..	..	..	..	..	3	2	3	4	12
Roxbury	2	1	..	..	4	..	..	..	2	—	1	..	..	..	8	1	..	..	1	..	..	..	1	1	3	5	10
Salem	..	2	1	1	2	2	..	2	1	6	3	1	..	..	19	1	..	..	..	..	..	1	8	1	3	9	21
Salisbury	15	3	1	1	2	6	5	6	6	7	7	..	..	..	36	8	7	..	..	..	..	8	15	15	11	18	59
Saybrook	..	3	..	2	1	..	1	2	2	1	..	..	..	..	8	1	1	1	..	..	1	..	3	1	6	2	12
Scotland	1	..	..	1	..	..	1	..	..	4	..	..	..	..	6	..	..	..	..	..	..	1	2	2	3	..	7
Seymour	9	2	..	..	5	1	..	8	2	5	..	..	..	..	25	4	..	..	..	..	..	3	8	8	6	1	32
Sharon	1	5	..	1	1	2	2	7	2	3	..	..	..	..	18	4	..	..	..	..	..	2	8	3	6	7	24
Sherman	2	2	..	1	4	2	..	5	..	3	2	..	..	..	13	8	..	..	..	..	..	..	3	3	7	8	21
Simsbury	6	..	..	2	4	..	2	1	7	10	4	..	..	..	25	5	5	..	1	..	..	..	11	7	6	12	36
Somers	1	1	2	1	2	2	1	1	1	7	1	..	..	..	18	1	1	..	..	..	..	..	8	5	4	3	20
Southbury	..	..	1	..	2	1	2	2	2	1	4	..	..	..	15	..	..	..	..	..	..	..	4	3	2	6	15
Southington	14	14	3	6	3	8	6	3	4	6	6	2	..	1	54	4	8	2	3	..	..	5	21	14	14	27	76
South Windsor	4	..	..	..	3	1	1	..	1	4	3	..	..	..	16	..	1	..	..	..	..	..	7	5	2	3	17
Sprague	19	8	1	1	6	3	1	3	2	6	4	1	..	..	37	3	5	..	3	..	6	1	17	6	17	15	55
Stafford	6	3	2	3	7	7	1	3	8	3	4	..	1	1	30	12	4	..	2	.	1	..	10	12	11	16	49
Stamford	30	6	14	12	9	12	11	11	13	19	10	6	..	1	93	29	23	2	3	..	4	..	49	39	21	45	154
Sterling	1	..	..	..	..	1	2	3	2	2	1	..	..	..	7	5	..	..	..	..	..	..	3	1	6	2	12
Stonington	11	16	6	11	13	7	9	5	8	14	15	3	1	2	77	22	16	4	..	..	2	..	33	37	26	25	121
Stratford	3	4	2	1	5	4	..	1	3	4	7	..	..	..	21	8	3	..	2	..	..	..	8	16	5	5	34
Suffield	4	..	2	1	3	2	4	..	8	8	5	..	..	2	32	3	1	1	2	..	..	..	8	7	12	12	39
Thompson	31	19	6	9	5	3	4	5	1	9	5	1	..	..	70	8	3	..	..	..	17	..	27	15	27	29	98

TABLE 5.—CONTINUED.

NAME OF TOWN.	Under 1.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Unknown.	Birthplace, Connecticut.	All Other States.	Birthplace, Ireland.	Birthplace, Germany.	Birthplace, England.	Birthplace, Sweden.	Other Foreign Countries.	Unknown.	Deaths in Spring.	Deaths in Summer.	Deaths in Fall.	Deaths in Winter.	Total.
Thomaston	8	5	...	2	2	5	1	...	1	1	1	...	...	...	22	1	1	2	...	...	...	...	4	9	7	6	26
Tolland	1	1	...	...	...	2	3	3	8	2	...	...	...	3	21	...	1	1	...	...	...	...	7	8	4	4	23
Torrington	1	5	...	2	...	3	4	5	8	9	4	...	...	1	27	5	5	...	4	...	1	...	9	10	14	9	42
Trumbull	2	...	1	1	2	...	1	2	2	2	4	...	...	...	16	...	1	...	...	...	...	...	3	4	5	5	17
Union	1	...	1	1	1	1	...	...	1	1	...	...	...	...	3	3	...	...	...	...	1	...	1	4	1	1	7
Vernon	32	8	6	7	10	6	8	8	8	6	3	...	...	...	63	10	14	9	4	...	...	2	30	29	25	18	102
Voluntown	3	2	...	1	1	...	2	1	3	1	...	...	...	...	...	...	...	...	...	...	...	14	2	3	6	3	14
Wallingford	17	2	4	3	5	3	2	3	7	6	8	1	...	...	51	1	4	2	1	...	2	...	17	18	14	12	61
Warren	1	...	...	...	...	...	...	2	2	2	...	...	...	...	5	...	1	1	...	...	...	...	3	3	...	1	7
Washington	4	2	...	2	...	4	2	3	8	7	2	...	...	...	32	...	1	1	...	...	...	...	15	11	4	4	34
Waterbury	90	24	26	18	31	26	10	21	20	16	7	1	1	...	189	23	51	3	10	...	6	9	81	65	79	66	291
Waterford	3	4	...	...	1	...	2	4	2	4	3	...	...	...	23	...	...	...	...	...	...	...	8	4	4	7	23
Watertown	10	...	...	...	2	6	1	1	...	6	1	...	...	...	24	...	...	...	...	...	...	3	6	8	7	6	27
Westbrook	...	...	...	1	...	...	...	1	2	4	5	...	...	1	14	...	...	...	...	...	...	...	4	3	5	2	14
West Hartford	5	1	...	2	1	...	1	3	4	2	1	...	...	...	16	3	1	...	...	...	...	...	6	4	3	7	20
Weston	1	...	1	1	1	...	...	1	3	2	1	3	...	...	13	1	...	...	...	...	...	...	4	4	4	2	14
Westport	10	6	1	2	7	5	4	4	3	6	5	2	...	...	44	3	5	1	2	...	...	...	16	12	15	12	55
Wethersfield	3	2	...	1	8	4	1	3	7	6	5	2	...	...	33	4	3	...	1	...	...	1	11	14	8	9	42
Willington	6	...	1	1	3	...	1	2	2	2	5	1	...	...	19	2	...	3	...	...	...	...	6	10	5	3	24
Wilton	...	...	...	...	2	3	2	4	4	1	5	...	...	...	18	...	2	...	...	...	1	...	6	6	3	6	21
Winchester	2	5	8	4	6	5	9	3	10	9	9	4	...	...	58	7	7	...	2	...	...	...	28	14	12	20	74
Windham	41	10	7	6	17	11	10	11	14	11	9	...	...	3	105	18	12	...	...	...	10	5	47	45	35	23	150
Windsor	2	2	4	8	4	4	8	4	6	9	2	...	...	...	38	5	7	...	1	...	1	1	17	11	9	16	53
Windsor Locks	5	1	1	1	1	1	...	1	4	1	...	...	...	...	13	1	2	...	...	...	...	...	5	2	4	5	16
Wolcott	...	...	1	...	...	1	1	...	2	1	1	...	...	...	5	...	2	...	...	...	...	...	2	2	2	1	7
Woodbridge	...	...	1	...	2	...	2	...	...	5	1	...	...	...	11	...	...	...	...	...	...	...	2	4	4	1	11
Woodbury	5	2	...	1	2	1	2	4	5	11	1	...	...	...	32	...	...	...	2	...	...	...	11	6	10	8	34
Woodstock	1	...	...	1	3	1	1	1	4	2	4	...	...	...	12	4	...	...	...	...	...	2	4	3	6	5	18
Totals	1761	919	401	482	782	667	612	731	904	1048	661	145	13	268	6524	958	1006	175	171	7	228	345	2608	2301	2095	2990	9394

RECAPITULATION OF TABLE 5.

		Per cent. to Total Mortality.
AGES.		
Deaths under 1 year,	1,761	18.7
Deaths from 1 to 5,	919	9.6
Total, First Period, Infantile,	2,680	28.3
Deaths from 5 to 10,	401	4.2
Deaths from 10 to 20,	482	5.2
Total, Second Period, Youth,	883	9.4
Deaths from 20 to 30,	782	8.5
" " 30 to 40,	667	7.5
" " 40 to 50,	612	7.2
" " 50 to 60,	731	8.0
Total, Third Period, the Productive Age,	2,792	31.6
Deaths from 60 to 70,	904	9.0
" " 70 to 80,	1,048	9.7
" " 80 to 90,	661	8.3
" " 90 to 100,	145	1.6
" over 100,	13	.1
Total, Fourth Period, Old Age,	2,771	28.7
Age not stated,	268	2.0
Total,	9,394	100.00
NATIONALITIES.		
Deaths of those born in Connecticut,	6,524	69.8
" " " in all other States,	958	9.9
Total for United States,	7,482	79.7
Deaths of those born in Ireland,	1,006	9.9
" " " in Germany,	175	3.2
" " " in England,	171	3.1
" " " in Sweden,	7	.1
" " " in all other foreign countries,	345	4.0
Total Foreign Births,	1,912	20.3
Total,	9,394	100.00
SEASON.		
Deaths in Spring,	2,208	23.5
" in Summer,	2,301	24.0
" in Autumn,	2,095	20.0
" in Winter,	2,790	32.5
Total,	9,394	100.00
BIRTHS.		
Births in Spring,	3,396	24.3
" in Summer,	3,500	25.6
" in Autumn,	3,458	24.3
" in Winter,	3,597	25.8
Total,	14,051	100.00

TABLE VI.

CAUSES OF DEATHS, BY MONTHS, AGE, AND SEX.

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Month not stated.	DISEASE.	Under 1 year.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Male.	Female.	Sex not stated.	Total.
						1							Arthritis							1							1			1
		2	3	2			2	1					Abscess	1		1		2	3	2	1						4	6		10
2	7	4	6	3	10	6	15	3	6	4	2		Accident	1	3	1	4	11	5	8	9	10	11	4	1		43	25		68
	1	1	2	3	1		1	1	2	1			Aneurism							2	4	3	4				8	5		13
1		2			1	1							Angina Pectoris								2	2	1				4	1		5
36	27	24	23	15	20	21	22	17	28	21	16		Apoplexy				1	5	8	18	40	58	90	47	3		135	135		270
1		1		1			1	1		1			Ascites									3	1	2			2	4		6
5	2	2	3		1		2	1	3	2			Asthma	3		1		4	5	2			3	1	1	1	12	9		21
									1				Addison's Disease						1								1			1
6	8	10	5	6	6	5	8	3	2	7	8		Bronchitis				2	4	5	5	9	14	18	12	4	1		45	29	74
10	6	7	6	2		3		3	4	9	12		Bronchitis, Capillary	46	14	2												37	25	62
18	20	20	15	15	29	26	19	5	9	21	14		Brain Disease	41	42	5	11	7	14	12	16	20	30	10	3			116	95	211
13	3	14	4	10	4	10	8	14	10	3	10		Bright's Disease			1	4	10	11	14	22	24	15	2			68	35		103
3	4	4	2	3		1	1	1	2	3	4		Burns and Scalds	1	16	3	1		1			3	1	2			15	13		28
2	1		1										Caries and Necrosis					2			1	1					2	2		4
24	7	20	14	15	14	25	24	20	10	16	20		Cancer						6	20	30	45	48	40	20		60	149		209
	2					2			1				Carbuncle						1		1	3					3	2		5
		1		2	1	2				1	1		Calculus and Gravel							4	2	2					8			8
6	4	5	4	4	9	6	8	4	4	2	3		Cerebro-Spinal Meningitis	8	17	5	9	2		4	7	4	1	1	1		32	27		59
8	5	8	8	2	6	2	5	4	6	6	4		Childbirth					30	24	10								64		64
1	1	2	2	5	27	124	134	40	16				Cholera Infantum	291	60												197	154		351
				1									Chorea					1									1			1
132	121	146	136	112	90	100	105	102	93	90	80		Consumption	25	28	16	142	302	270	185	125	112	72	30			554	753		1307
2	1	1					1	3					Colic	3	1				3	1			2				6	2		8
19	20	32	15	16	18	28	30	20	23	20	15		Convulsions	140	78	14	5	6		2	3	5	2	1			120	136		256
22	13	16	13	5	4	7	8	8	19	15	19		Croup	47	86	16											80	69		149
2			1	2	3	1	2	2		1	2		Cyanosis	16													10	6		16

1	2	1	1	1	3	3	6		3	1	1		Cystitis						2	4	1	6	10				16	7		23
		1											Chicken Pox		1												1			1
4	7	10	18	10	15	8	11	9	8	7	4		Debility and Atrophy	39	3		3	4	4	6	5	18	19	10			60	51		111
3	3	4	5	4			2	3	2	3			Diabetes				3	4	2	4	5	3	4	4			17	12		29
1	2	3	1	3	2	9	25	14	16	6	4		Diarrhœa	18	5	3	1		4	8	10	8	10	7	12		44	42		86
36	20	22	19	16	11	10	11	21	48	18	24		Diphtheria	26	120	68	32	5	4					1			112	144		256
20	7	12	12	16	10	8	13	14	12	16	10	4	Dropsy and Anæmia	6	6	2	3	1	8	10	22	52	34	10			70	84		154
	1	4	5	4	10	6	11	5	4	1	4		Drowning	3	7	6	12	9	6	5	2	2	3				36	19		55
3		3	2		2	7	27	13	12	6			Dysentery	10	12	1	2	1	2	8	10	8	14	5	2		43	32		75
1	1				1	1	1						Embolism					1		2	1	1					4	1		5
5	3	2	4	3	6	5	10	8	6	6	2		Enteritis	16	12	2	4	3	8	4	2	4	5				31	29		60
2	4	3	2	3	2	1	4	1	2	3	2		Epilepsy	1	1	7	2	3	4	6	4	1					10	19		29
													Epistaxis																	
8	4	10	3	5	8	1	2	2	1	2	3		Erysipelas	2	4	2	3	6	4	4	6	8	6	4			19	30		49
													Exposure																	
1		1	3	4	2	4	2	2			2		Fever, Congestive		1		1	3	3	3		5	4	1			12	9		21
2	2		3	2	4	5	6	1	5	4	1		Fever, Intermittent	2	1	2	3	5	3	4	1	3	5	4	2		15	20		35
2	2		5		2	1	2	5	2	2	2		Fever, Remittent			6	5	2		6	3	1	2				12	13		25
15	10	10	12	11	4	4	17	26	17	15	18		Fever, Typhoid	14	18	10	36	30	8	14	9	9	10	1			79	80		159
	7	5	5	8	5	8	19	16	30	8	6		Fever, Typho-Malarial	4	15	14	12	18	14	10	14	14	1	1			62	55		117
1										1			Fistula						1	1							2			2
8	4	8	6	4	5	4	14	10	6	5	9		Fractures and Contusions	3	5	7	10	6	6	6	10	13	12	5			53	30		83
1											1		Freezing							1	1						2			2
		1											Glanders						1								1			1
2	3	2	10	2	6	12	6	8	8	4	10		Gastritis	14	4	3	4	6	5	4	6	10	13	3	1		33	40		73
2	3	1	2	1	1	1		1		2			Gangrene								1	5	5	2	1		9	5		14
26	42	42	41	40	32	23	38	25	40	42	48	1	Heart Disease	18	4	9	23	26	28	40	55	112	86	35	4		226	214		440
						1	1						Heat, Sunstroke									2					2			2
1	4	2	2	3	3	3			3	1			Hemorrhage	4				2	1	2	3	5	3	2			9	13		22
1	2	2	2		2	1	2	1	2	5	1		Hepatitis			1	2	4	4	4	4		2				13	8		21
	1	3	1	2	1	2	2	4	3	2	1		Hernia						3	6	5	2		6			10	12		22
1			1	2			2	1					Homicide					3	2	2							5	2		7
5	6	5	5	2	6	12	6	5	7	3	3		Hydrocephalus	30	25	6	4										35	30		65
1					1								Hydrophobia						1			1					2			2
6	2	8	5	4	3	8	4	4	4		2		Insanity				2	6	10	14	6	12					24	26		50

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Month not stated.	CAUSES.	Under 1 year.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Age not stated.	Males.	Females.	Sex not stated.	Total.
4	3	2	4	3		2	5	1	2	1	2		Intemperance					2	10	8	4	3	2					20	9		29
						2							Intussuception	1	1													1	1		2
2	1	1	4	1	2	5	2						Jaundice	4	2	1			2		3	2	2	1	1			8	10		18
1		2	3		1			1	2	1	2		Joint Disease		1	1	5	1	1	2	2							6	7		13
		1											Hanging, Execution						1									1			1
3	4	2	6	2	4	6	7	2	2	4	2		Kidney Disease				2	4	4	6	5	6	12	5				28	16		44
1	2		1		3	1	2	1	2	3			Laryngitis		7	4	2		1	1		1						6	10		16
1						1		1					Lightning					2	1									2	1		3
6	6	8	5	6	13	4	9	7	6	10	2		Liver, Disease of	5	1	1		2	4	12	13	20	16	8				38	44		82
34	18	16	12	6	9	8	5	8	10	13	16		Lung, Disease of	30	16	6	11	22	3	15	11	14	13	12	2			81	74		155
2	3	2		3	2	3	1		2	4	2		Malformation	22	1	1												11	13		24
		1	1	1		1	1		1		8		Measles	4	7	1	1	1										5	9		14
10	7	11	7	14	18	14	15	11	14	3	10		Meningitis	32	56	16	12	6	3	3	1	4	1					80	54		134
				2		1	2		2				Mortification					2	2	3								4	3		7
						1	1	1					Neuralgia							2	1							2	1		3
													Necrosis																		
	1		2	3	2				3	1			Nephritis				2	1	3	1		3		2				10	2		12
56	35	48	42	31	21	36	34	30	35	40	30	11	Not Stated	112	46	18	20	30	36	28	26	36	39	31	9	1	17	210	209	30	449
70	50	63	50	34	36	43	32	39	34	30	41		Old Age									14	138	268	90	12		224	298		522
1	1	2	1	1	1				1	2			Ovarian Tumor					1		2	1	6							10		10
	2	1	1			1	1						Ovarian Dropsy						1		3	1	1						6		6
1											1		Phlebitis							1	1							2			2
20	14	30	18	39	20	23	21	20	20	15	20	4	Paralysis	2	1	4	4	5	13	35	56	85	51	8				124	140		264
1	2	2	4	2	4	2			3	1	7		Pericarditis			1	4	3	2	2	2	3	5	5	1			13	15		28
9	6	8	10	7	4	10	16	10	8	12	6		Peritonitis	10	4	3	18	16	11	8	10	11	12	3				48	58		106
2			1	1	2	2	1	3	2	2	1		Pleurisy				1	2	1	2	4	2	3	2				8	9		17

127	105	107	70	42	26	12	14	14	31	21	57	..	Pneumonia	62	56	24	19	50	38	40	71	104	98	51	7	....	6	332	294	....	626
1	....	....	..	2	1	..	1	2	4	2	2	..	Poison	1	2	1	..	2	2	....	4	2	....	1	....	....	....	7	8	....	15
30	20	30	21	22	11	21	15	10	12	30	20	..	Premat'e Birth & Debility	242	..	..	..	..	....	....	....	....	....	....	....	....	....	140	102	....	242
1	....	1	..	1	..	1	..	..	..	..	..	..	Pyaemia and Septicaemia	....	..	..	..	1	....	....	3	....	....	....	....	....	....	2	2	....	4
2	1	....	..	..	..	..	..	..	..	..	1	..	Privation	....	..	..	..	..	....	....	1	1	1	1	....	....	....	2	2	....	4
....	....	1	..	2	..	..	..	..	..	..	..	..	Prostatitis	....	..	..	..	..	....	....	....	....	....	2	1	....	....	3	....	....	3
6	1	4	4	4	6	..	2	2	2	1	1	..	Puerperal Fever	....	..	..	1	17	12	3	....	....	....	....	....	....	....	....	33	....	33
....	1	....	2	..	..	1	..	..	2	..	..	..	Puerperal Convulsions	....	..	..	1	2	3	....	....	....	....	....	....	....	....	....	6	....	6
....	1	....	..	..	..	..	..	..	..	..	..	..	Puerperal Mania	....	..	..	..	1	....	....	....	....	....	....	....	....	....	....	1	....	1
1	....	....	..	..	..	..	..	..	..	..	..	..	Purpura	....	..	..	..	..	....	1	....	....	....	....	....	....	....	1	....	....	1
1	1	....	..	..	6	1	..	2	2	2	..	..	Railroad Accidents	....	..	..	7	2	1	1	1	1	2	....	....	....	....	10	5	....	15
4	3	2	3	10	4	5	8	4	5	3	3	..	Rheumatism	....	..	3	2	4	3	8	10	7	4	8	5	....	....	30	24	....	54
32	18	20	15	10	15	8	4	6	8	17	11	..	Scarlatina	10	74	50	26	2	2	....	....	....	....	....	....	....	....	86	78	....	164
2	4	2	2	6	3	2	..	..	2	..	..	2	Scrofula	3	1	4	5	2	3	4	1	....	2	....	....	....	....	14	11	....	25
....	....	....	..	1	1	..	1	..	..	1	..	..	Skin Disease	2	..	..	..	..	....	....	....	1	....	1	....	....	....	2	2	....	4
1	....	....	..	..	..	..	..	..	..	..	3	..	Small Pox	....	1	..	..	..	2	1	....	....	....	....	....	....	....	4	....	....	4
1	....	....	..	3	1	..	2	..	2	..	2	..	Spina Bifida	10	1	..	..	..	....	....	....	....	....	....	....	....	....	3	8	....	11
....	....	1	..	..	..	4	1	2	..	..	..	..	Spinal Disease	1	..	..	2	..	....	1	1	2	1	....	....	....	....	5	3	....	8
1	....	....	..	..	1	..	2	..	..	..	..	..	Spleen Disease	....	..	..	..	..	1	2	1	....	....	....	....	....	....	2	2	....	4
2	5	4	1	2	3	4	1	8	5	3	2	..	Stomach Disease	7	..	2	1	2	4	3	8	3	8	2	....	....	....	18	22	....	40
....	....	....	..	..	1	..	..	..	..	..	..	..	Stricture of Oesophagus	....	..	..	..	..	....	....	1	....	....	....	....	....	....	1	....	....	1
....	1	....	2	3	..	..	2	..	..	1	..	..	Stricture of Intestines	....	..	..	..	..	....	4	1	2	2	....	....	....	....	3	6	....	9
1	....	1	..	..	..	..	..	..	..	..	..	..	Stricture of Urethra	....	..	..	..	1	1	....	....	....	....	....	....	....	....	2	....	....	2
30	25	24	30	23	15	30	25	12	22	20	30	..	Stillborn	286	..	..	..	..	....	....	....	....	....	....	....	....	....	154	132	....	286
2	2	3	1	5	.	..	2	1	2	3	..	..	Sudden	3	4	1	2	2	4	1	2	1	1	....	....	....	....	16	5	....	21
2	....	....	2	3	..	..	..	..	2	..	2	..	Suffocation	7	2	1	..	..	1	....	....	....	....	....	....	....	....	5	6	....	11
1	1	....	..	3	1	..	..	..	..	..	..	..	Suicide	....	..	..	..	..	2	2	2	....	....	....	....	....	....	4	2	....	6
2	....	....	1	..	2	..	..	..	1	..	2	..	Suicide by Wounds	....	..	..	1	1	2	2	2	....	....	....	....	....	....	6	2	....	8
....	1	2	2	..	1	2	..	..	5	1	3	..	Suicide by Poison	....	..	..	2	2	2	4	5	2	...	....	....	....	....	10	7	....	17
....	....	....	..	..	..	2	..	..	3	2	1	..	Suicide by Hanging	....	..	..	..	..	1	4	....	1	2	....	....	....	....	6	2	....	8
1	....	1	1	3	4	4	3	2	..	..	..	..	Suicide by Drowning	....	..	..	..	..	4	5	4	4	2	....	....	....	....	12	7	....	19
....	1	....	1	..	..	..	2	2	..	1	..	..	Syphilis	1	..	..	..	2	2	2	....	....	....	....	....	....	....	5	2	....	7
3	2	4	4	3	6	8	8	8	6	4	5	..	Tabes Mesenterica	40	7	2	1	5	2	2	....	1	1	....	....	....	....	31	30	....	61
....	....	2	4	1	5	4	6	5	2	4	4	..	Teething	20	17	..	..	..	....	....	....	....	....	....	....	....	....	18	19	....	37
1	2	1	2	5	3	2	3	1	3	3	..	..	Tetanus	8	..	2	4	4	4	1	....	2	1	.	....	....	....	16	10	....	26

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Month not stated.	CAUSES.	Under 1 year.	1 to 5.	5 to 10.	10 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	90 to 100.	Over 100.	Age not stated.	Males.	Females.	Sex not stated.	Total.
1	....	1	.	..	1	..	..	..	..	..	1	..	Thrush	4	..	.	..	..	....	....	....	....	....	....	....	....	....	2	2	....	4
1	3	1	1	1	..	..	..	..	..	2	..	..	Ulcer	....	3	..	1	2	....	1	....	2	....	...	....	....	....	5	4	....	9
....	2	3	2	2	3	1	3	2	3	2	2	..	Ulceration of Intestines	....	..	..	..	2	2	6	8	3	3	1	....	....	....	11	14	....	25
4	2	2	..	..	1	2	2	2	1	2	..	..	Uraemia	....	..	..	1	1	4	....	2	2	4	2	2	....	....	13	5	....	18
....	1	1	2	1	..	1	2	1	2	1	2	..	Uterus, Disease of	....	..	..	..	..	2	5	3	4	....	....	....	....	....	....	14	....	14
....	....	....	1	..	..	1	2	1	2	1	1	..	Uterus, Tumor of	....	..	..	..	..	3	2	4	....	....	....	....	....	....	....	9	....	9
1	....	1	..	1	..	2	..	1	.	..	..	..	Violence	....	..	..	2	1	....	3	....	....	....	....	....	....	....	4	2	....	6
10	6	4	3	6	4	10	4	10	4	7	6	..	Whooping Cough	40	30	3	..	1	....	....	....	....	....	....	....	....	....	34	40	....	74
...	....	3	1	..	..	2	3	3	4	5	1	..	Wounds	....	..	4	5	..	6	1	2	....	4	....	....	....	....	14	8	....	22

BIRTHS.

The total number of births reported was 14,051, an excess of 552 over the preceding year. The returns are in many instances more complete than during any previous year, due for the most part to the efforts of the registrars, although the returns from physicians are also better, and indicate that more attention is paid to the law. The importance of securing the name of the child for registration cannot be too often impressed upon all those engaged in the execution of the law, and both physicians and registrars are urged to use every endeavor to make their returns and record as complete as possible. It is the duty of the physician to return the birth, but if he neglects this the registrar is entitled to the whole fee if he supplies the deficiency. It is too often, if indeed not always, the custom for physicians attending cases outside of the town in which they live to neglect to make any return of the birth, or if any be made, to return it in their own town. The attention of registrars is called to this evil, and if possible they should secure such returns. The certificates of birth could easily be sent by mail, and the fees returned at the end of the year. The value of these records for purposes of identification, and the annoyance and loss that ensue from their deficiencies, are illustrated again and again, so often that it seems needless to urge attention to these duties, but negligence and disregard of registration laws and details are far too common.

There were of these 14,051 births, 7,293 males and 6,693 females,—excess of male births, 400. Of 65 the sex was not returned, and also, it is to be presumed, the name omitted, else the sex might have been inferred. The excess of births over deaths was 4,657, a gain of 483 over 1878, due partly, no doubt, to more complete returns. The proportion of males to females is 109.72 male births to every 100 female, a little below the mean ratio for the last twenty years, which is about 110+ males for every 100 females. The general average in England and Continental Europe is a little over 105 males to every 100 females. There were 154 twin births and 160 illegitimate reported, an excess of 30 twin births and of 22 illegitimate over 1878.

These were distributed as follows. The general birth-rate for each county is as follows :

	Birth Rate per 1000.	Twin.	Illegitimate.
Hartford County,	23.5	32	44
New Haven "	25.8	40	45
New London "	19.8	10	16
Fairfield "	19.1	24	28
Windham "	25.0	13	8
Litchfield "	19.4	17	7
Middlesex "	28.2	9	6
Tolland "	21.4	9	6
Total,		154	150

The average birth-rate per 1,000 for the State is 21.8. As seen by the table, the highest birth-rate (25.8) is in New Haven county; the lowest (19.1) in Fairfield county. The highest birth-rate of any town in the State is in Thomaston—40.8; and the lowest in Monroe—6.8; this town, curiously enough, reports the same death-rate—6.8. The larger proportionate birth-rates in the manufacturing towns, where the foreign population is congregated, are very striking. Thus, Easton and Putnam, 35; New Haven, 31.2; Meriden, 28; New Britain, 29.3. These generally range higher than the average for the county in which they are situated. The birth-rates for the different towns vary somewhat with the accuracy of the returns. In quite a number of instances the birth-rate is less than the death-rate very markedly, as in Morris, where the birth-rate is 7.5, the death-rate, 27.5; Salem, 12 birth-rate to 36 death-rate; more often slightly in excess, as Colebrook, 12 to 14; West Hartford, 8.2 to 10.9; Wethersfield, 17.9 to 19.3; but in no other instance than Monroe is it evenly balanced. In general the birth-rates largely exceed the death-rates, as in New Haven, 31.2 to 16.3 death-rate; Brooklyn, 23.8 to 12.1, and so on. In some cases the discrepancy is cause by the imperfections in the returns, in some by the special efforts to secure complete returns of deaths.

The following table shows the nationalities of those born of foreign-born parents, by counties.

COUNTIES.	Irish.	English.	Canadians.	Germans.	Scotch.	Swedes.	French.	Portugese.	Danes.	Italians.	Swiss.	Mixed.	Total.
Hartford.........	712	75	44	139	18	14	2	..	7	1	1	15	920
New Haven......	912	117	68	350	8	3	2	..	..	2	..	44	1,508
New London.....	270	30	166	30	12	2	..	16	..	..	1	11	522
Fairfield.........	413	45	3	110	6	5	2	..	..	5	1	40	627
Windham....... ..	125	15	358	5	2	2	..	1	..	1	..	5	514
Litchfield........	170	17	19	22	9	3	8	..	..	..	..	6	254
Middlesex....... ..	124	27	3	24	3	13	3	..	..	1	..	4	205
Tolland..........	50	10	21	42	6	2	..	1	2	..	..	12	139
Total	2,776	336	682	722	56	44	17	17	9	10	3	137	4,689

This includes all births of foreign parentage where the nationality of the parents were stated. By mixed is meant father of one nationality, mother of another. The increase in the number of Canadian births is indicative of a large immigration to the manufacturing towns of Windham and New London counties of Canadians. The number of the Germans is also evidently increasing. The Swedes are beginning to figure among the population. Excepting the settlement in New London, there are few if any Portuguese in this State. By mistake, the number representing the Irish births last year in Tolland county was printed 469 instead of 69, as it should have been. Among other foreign nations, Russia is represented by 1; Western Islands, 6; Norway, 2; Azores, 1; Nova Scotia, 2. On the whole the number of births from foreign-born parents is less than in 1878, but not very markedly.

The following table shows the age of the mother at the birth of the first child, selecting representative ages, 18–20, 20–30, and so on, representing both American and foreign-born mothers, as far as the returns were complete, which is the case in the great majority of towns. That is, these facts were stated in regard to the greater number of births.

NO. OF MOTHERS AT	American Mothers.					Foreign-Born Mothers.				
	15 to 18.	18 to 20.	20 to 30.	30 to 40.	40 to 50.	15 to 18.	18 to 20.	20 to 30.	30 to 40.	40 to 50.
Birth of 1st child.	56	502	1,498	241	11	4	99	517	153	4
" 2d " .	..	91	1,270	378	9	..	19	688	174	3
" 3d " .	..	16	785	590	13	..	3	439	269	3
" 4th " .	..	1	362	364	12	..	...	307	326	9
" 5th " .	..	...	156	284	14	..	...	194	347	10
" 6th " .	..	...	90	265	12	..	...	46	312	29
" 7th " .	..	...	11	61	15	..	...	14	107	14
" 8th " .	..	...	.....	48	10	..	...	.....	56	16
" 9th " .	..	...	.....	25	5	..	...	.....	65	17
" 10th " .	..	...	.....	7	4	..	...	.....	26	14
" 11th " .	..	...	.....	2	5	..	...	.....	12	8
" 12th " .	..	...	.....	3	2	..	...	.....	6	7
" 13th " .	..	...	.....	3	1	..	...	.....	1	4
" 14th " .	..	...	.....	2	...	..	...	.....	.....	...
" 15th " .	..	...	.....	.....	...	..	...	.....	1	4
Total....	56	610	4,152	2,373	111	4	121	2,205	1,855	132

This table is very interesting and instructive. The greater number of foreign-born mothers that bear more than the sixth child is very forcibly shown, the numbers in the first half of the table falling very rapidly. In studying the table, it must be borne in mind that the American mothers exceed the foreign-born by 1,453, which increases the ratio in favor of the larger families among the latter. There was one birth reported, father's age seventy, mother's sixty-nine; the nationality of the parties was not stated. Such instances are not frequent.

MARRIAGES AND DIVORCES.

There were 4,373 marriages and 316 divorces reported in 1879, a gain of 58 marriages over the preceding year, and 85 less divorces, which verifies the prediction that the repeal of the omnibus clause in the divorce laws would show an immediate effect upon the number of divorces. The number of marriages, however, still shows the pressure of hard times, and is much below the average, especially when the increased population is considered; the number last year was the least for fourteen years, and 1879 shows but slight gain, helped somewhat, however, by the decrease in divorces. The increasing difficulty of obtaining a livelihood, and the decrease of early marriages, as well as of the total number, indicates a massing of population, and a tendency towards the state of affairs found in the old world. Either marriages must decrease or the economies of life increase so that comfort can be secured on less income. This has a far greater influence than the increase of crime and licentiousness, often adduced as the cause of the decrease in the number of marriages, and especially of early marriages.

There was one marriage reported where the age of the bride was 14, age of groom not stated. The earlier age, comparatively, at which women marry is strikingly brought out in this table.

Thus, 642 more women are married before the age of twenty than men. After thirty the number of marriages declines very notably, as is seen when the second and third marriages are subtracted from the totals. The greater number of second and third marriages in men is noticeable, while widows in such cases do not appear to have the entire preference. In 187 of these it was the first marriage on the part of the woman. This leaves, however, 393 where it was the second marriage in both cases.

Of these marriages, in 2,958 both parties were of American birth. In 752 both were of foreign birth. Of the remainder, in 257 the husband was born in this country, in 389 the wife. The other parties foreign-born, 17, not stated. There were 162 marriages of non-residents, and 334 where the husband only resided out of the State. Three towns, Hartland, Rocky Hill, and New Fairfield, report no marriages; six reported one each: Marlborough, West Hartford, Beacon Falls, Bethany, Chaplin, Bolton. Five report 2 each; East Granby, Wolcott, Middlefield, Lisbon, Andover. Several reported three and four; all these were much below the average.

The following table shows the approximate age. As this is the first of the kind compiled in this State, it is impossible to make any comparative statements. The table also gives the number of first, second, and third marriages, etc.

Table Showing Ages at Marriage, and the Number of 1st, 2d, 3d, and 4th Marriages During the Year 1879.

BRIDES' NUMBER OF FROM	15 to 20.	20 to 30.	30 to 40.	40 to 50.	50 to 60.	60 to 70.	70 to 80.	80 to 90.	TOTAL.
At First Marriage,....	752	2,666	305	68	23	3	..	1	3,817
Second "	4	122	125	80	54	22	2	1	411
Third "	....	......	....	3	3	..	..	..	6
Totals, ...	756	2,788	436	151	80	25	2	2	4,234
GROOMS, NUMBER OF.									
At First Marriage,....	114	2,850	537	105	20	3	..	1	3,630
Second "	....	136	96	168	102	72	6	..	580
Third "	....	2	1	7	5	6	1	..	22
Fourth "	....	......	....	1	....	1	..	..	2
Totals, ...	114	2,988	634	281	127	82	7	1	4,234
Number not stated,...	....	......	....	....	....	..	..	..	139
									4,373

DIVORCES.

The following discussion of the divorce laws appeared in the *Evening Post*, of Hartford; as it presents the history so well it is transcribed here.

" Only a brief period of time elapsed after the settlement of the Colonies of Connecticut and New Haven before divorces began to be granted, and prior to the union of the two colonies upwards of twenty unhappy couples had been legally separated. The first divorce granted by Connecticut was for desertion, in May, 1655. In the revision of the statutes of 1672, the only reference made to the subject is under the title of courts, where the court of assistants is vested with the right of divorce. The first Connecticut law defin-

ing the subject was enacted in October, 1677, when they were authorized in case of adultery, fraudulent contract, desertion three years with total neglect of duty, and seven years' absence of one party without being heard from. In the latter year Mary Murraine was released from her conjugal tie with Patrick Murraine 'with libertie to disspose herself in marriage as God shall grant her oppertunety.' Down to 1843 divorces were granted by the courts for the above causes only, and a person desiring a divorce for any other reason had to apply to the General Assembly. But very few applications to the legislature are on record. In 1843 habitual intemperance and intolerable cruelty were also added as legitimate causes for divorce.

PASSAGE OF THE OMNIBUS CLAUSE.

In 1849 exclusive jurisdiction in regard to divorces was given to the Superior Court, and in addition to the causes of divorce then in existence were added the following: Sentence to the State prison for life; bestiality or the commission of any infamous crime involving a violation of the conjugal relations and punishable by imprisonment in the State prison; any such conduct as permanently destroys the happiness of the petitioner, and defeats the purpose of the marriage relation. The last clause mentioned is now known as the famous, or infamous, 'omnibus clause.'

"It will be seen by the above, therefore, that subsequent to 1849 there were nine causes on the statutes under which divorces could be obtained. Of these it will be noticed that the 'omnibus clause,' although appearing on first inspection a good and sufficient cause for divorce, still, when carefully considered, it will be seen that great latitude is given by it. Under this clause a divorce could be granted on almost any grounds, and so ingenious were some of the causes that it has been said that it was only sufficient for the petitioner to allege and prove 'cold feet' on the part of the respondent in order to obtain a divorce. The methods of serving the notice of the petitioner for the decree to the respondent were also faulty, and many instances of the abuses arising from this might be cited. Advantage of the law was taken not only by residents of Connecticut, but also of other states.

"By the omnibus clause the widest range was given to persons desiring a divorce, and the number of them increased with astonishing rapidity. In his extended treatise on the subject of divorce, published in *The New Englander* in the year 1867 and 1868, Ex-

President Woolsey, of Yale, thoroughly discusses the subject, and plainly shows the license granted for separation to disaffected couples under it. According to Dr. Dwight, as quoted by President Woolsey, the number of divorces in Connecticut subsequent to the passage of this clause in proportion to the population far exceeded the same proportion in France in '93. The marriage-chains being so easily broken, about the year 1870 a crusade against the omnibus clause was begun. In his message to the General Assembly in 1871 Governor Jewell spoke as follows:

"'Our divorce laws, unless changed, bid fair to bring us into disrepute. They are notoriously loose, more so than of any other State except Indiana and Illinois. In the year 1870 there were in this State 408 divorces and 4,871 marriages, a ratio of about one to twelve, which has been about the proportion for several years. In Vermont the ratio is one to twenty-one, in Ohio one to twenty-seven, in Massachusetts one to forty-four. Divorces may be granted in this State for too many causes, in fact for almost no cause at all. Discontented and vicious people come here from other States to get divorces which the more strict legislation of their own States deny, thus creating much scandal, and tarnishing the fair fame of our State. Some marked cases of this kind have occurred in the past year, which loudly call for reform in our laws.'

"The matter excited the general interest of the best citizens, and at the session of 1871 the legislature passed a resolution appointing a committee, consisting of one senator and eight representatives, to consider so much of the Governor's message as related to divorce. The committee, of which Hon. Elisha Johnson of Hartford was chairman, gave all parties interested an extended hearing. At the hearing almost every religious denomination was represented by able clergymen, and prominent members of the bar earnestly advocated a revision of the divorce laws. No one appeared in favor of the then-existing statute. In their report the committee recommended several changes in the statutes applying to divorce, among which the chief were that the respondents should not be allowed to marry again without the consent of the court; that the petitioners should not be allowed to marry for two years; also that the process, or legal machinery, in regard to the serving of the notice of the petition upon the respondent, should be radically changed. The committee introduced a bill to the above effect and it passed the Senate almost unanimously, but as there was no one to champion it in the House it was defeated.

REPEAL OF THE "OMNIBUS CLAUSE."

"The opponents of the omnibus clause did not lose heart at this failure, but kept steadily at work until the January session of the year 1878; Governor Hubbard being Governor, the omnibus clause was repealed, and the causes for which divorces may now be granted were reduced to the following, viz.: adultery, fraudulent contract, wilful desertion for three years with total neglect of duty, seven years' absence during which the absentee has not been heard from, habitual intemperance, intolerable cruelty, sentence to imprisonment for life, any infamous crime involving a violation of conjugal duty. The reformers also succeeded in changing the methods of serving the notice of the petitioner, and at the last session of the legislature, January, 1880, an act was passed providing that no decree of divorce shall be granted until ninety days after the complaint is made returnable. This was a great victory for the anti-omnibus men, but the statute is not yet as the extreme representatives of the party would wish it. As the law stands, it is competent for any couple to disregard the family ties and separate merely by consent and the performance of the formalities of the courts. In many instances it is a subject of contract between the parties as to which shall appear in the position of respondent, and it seems to be considered an act of gallantry that the man should thus appear. There is an instance in the State of a woman who has been married and divorced four times, and each of her husbands in turn married again and been divorced. Her first husband procured a divorce from her, and she was married again. Becoming divorced from her second mate she remarried the first, and has since been divorced from him and has married a fourth time. Her second husband has been married and divorced twice, and both his wives are now living, and her present husband was a divorced man when she married him. It is no uncommon thing to find women under 30 years who have been twice divorced, and there are many cases of women under 19 years of age. As the law now stands, people dislike to have their names appear on the records as having been guilty of any of the offenses enumerated, and to this also the decrease in the number of divorces granted is due.

ENCOURAGING DECREASE IN THE NUMBER OF DIVORCES.

"The subjoined table, compiled from the State records, shows the great falling off in the number of divorces in the year 1879, when the law first went into effect:

Divorces in Ratio to Marriages.

YEAR.	Divorces.	Marriages.	Ratio.
1874..................	492	4,694	1 to 9.5
1875..................	476	4,385	1 to 9.4
1876..................	396	4,320	1 to 10.9
1877..................	427	4,319	1 to 10.1
1878..................	401	4,315	1 to 10.7
1879..................	316	4,342	1 to 13.7

Total proportion of divorces to marriages for the five years preceding 1879, ... 1 to 10.0
Proportion of divorces to marriages for the year 1879, ... 1 to 13.7
Per cent. of decrease for the year 1879, . . 27.

"By the above it will be seen that the decrease in the number of divorces during the first year after the repeal of the loose omnibus bill has been very large. The table is compiled from the records of the State librarian down to the year 1878, and after that from those of the Secretary of the State Board of Health. The returns for the year 1880 are not as yet compiled, but will probably show a large decrease in the number of divorces. The proportion of divorces to marriages for the five years preceding 1878 is almost identical with that of the previous twenty years, and gives a comprehensive idea of how easily a divorce could be obtained in Connecticut."

The following tables show the number of divorces by counties, and the causes. The tables do not exactly correspond, as several causes are often assigned, but the form is retained for uniformity of comparison.

NUMBER OF DIVORCES 1879, AND PRECEDING YEARS.

COUNTY.	Husband's Petition.	Wife's Petition.	Total in 1879.	Total in 1878.	Total in 1877.	Total in 1876.	Total in 1875.	Total in 1874.	Total in 1873.	Total in 1872.
Hartford	16	35	51	74	72	91	73	86	70	75
New Haven	22	62	84	111	97	103	52	131	107	119
New London	12	23	35	52	44	54	51	63	67	61
Fairfield	16	47	63	74	92	58	73	76	71	84
Windham	8	19	27	28	35	17	36	46	51	28
Litchfield	11	12	23	23	36	25	45	39	40	31
Middlesex	3	11	14	18	23	21	25	18	25	25
Tolland	6	13	19	21	28	27	21	33	26	41
Total	94	222	316	401	427	396	476	492	457	464

CAUSES.

	Hartford County.	New Haven County.	New London County.	Fairfield County.	Windham County.	Litchfield County.	Middlesex County.	Tolland County.
Adultery	13	23	11	8	8	7	3	3
Intemperance	10	14	6	30	6	2	4	4
Infamous Crime	..	2	..	..	..	..	..	..
Cruelty	3	18	8	12	2	4	3	2
Desertion	23	33	10	44	11	14	5	9
Fraudulent Contract	..	1	..	..	..	..	..	..
Misconduct	1	1	..	..	..	..	1	1
Life Imprisonment	1	..	..	..	..	..	..	..

CAUSES OF DEATH.

It is now pretty generally agreed that one of the chief elements in the wealth or capital of a State is its population. Indeed, the numerical value of each individual has been reduced to an average. Taking the population generally, each person represents a value of one thousand dollars; more exactly, each adult male sixteen hundred,* each adult female twelve hundred and fifty dollars. We have adapted the term productive period to that from twenty to sixty, as during that period each one produces more than the cost of his maintenance, averaging $130 a year during this period. Hence in estimating his value or loss the accrued wages must be added, as well as those he would have earned, in case of death before the average duration of life be reached. It is therefore evident, as the doctrines of Malthus have little following, that the prosperity of the State is increased by any measures that tend to increase the average duration of life, and the number that pass through this period in full health. Estimating the preventable deaths at one-fifth, the proportion usually conceded as wasted lives for the want of observance of sanitary laws, there were in 1879 560 needless deaths of persons within these limits—500 in round numbers. Taking $1,300 as an average value of these lives—not a high estimate—and we have $650,000 as the direct loss of capital, to which must be added the accrued wages sum.

Yet those measures that directly promote health and prolong life receive comparatively little attention commensurate with their claims. We go on polluting the soil around our dwellings and villages by sink-drains, vaults, and cess-pools, until it in turn contaminates the water that percolates through it to reach the well from which we slake our thirst, or the air that sweeps over it, already garbage-laden or poisoned by excrementitious filth, the dried particles from neglected refuse loading the air. The peaceful brooks are made vehicles of death, tons of waste and filth often actually thickening the water, which again pours forth the gases of decay to convey the germs of disease, till a wide-spread epidemic calls passing attention. Because these influences are *cumulative*, and time must often elapse ere the point of saturation is reached, too often thoughtlessness and neglect quickly succeed frightened attention. This is not, fortunately, invariably true. There are some lessons that have been thoroughly learned, and sanitary science now rests upon sure foundations, to say the least.

*London Economist.

CONSUMPTION AND LUNG DISEASES.

Consumption, as ever, outranks all other causes many times over, causing 1,307 deaths in 1879, about the usual average. This disease now ranks in the preventable class. Careful research has shown that only 25 per cent.* of cases are due to hereditary tendencies; the rest caused by unsanitary influences, the chief being breathing impure air, and especially rebreathing that devitalized by our own or another person's lungs. This is shown by the greater prevalence of consumption among men when they work indoors and women work outdoors, and the reverse, by the statistics of prison life and the picked armies and navies of the world. An important element in its causation, as before stated, is soil-moisture, and damp, ill-drained sites for homes have caused many needless deaths. The experience of all observing physicians corroborates this. Certain houses invariably induce consumption in any families that live long enough in them. The total from other diseases of the lungs is 890, making a grand total of 2,197, nearly a fourth of the total mortality. The number of deaths from pneumonia is unusually large—626; the average for the last few years being about 450. There were many reported as typhoid-pneumonia, and in others the description resembled closely the pyogenic form due to filth. As these cases were multiple, that is, several in one family or locality, their causation from unsanitary causes is more than probable. The same is true of many of those reported as typhoid-pneumonia. In other instances there were malarial complications so marked that the physicians in attendance called the variety malarial-pneumonia. One very singular fact is the prevalence of the disease throughout the year, though to a much greater extent in winter, when there were 289 deaths, 219 in spring, 252 in summer, 66 in autumn, March being the trying spring month. The deaths among males was in excess, while in consumption the deaths of females is 200 in excess, which fact bears out one theory of the causation of consumption, as women more often breathe the impure air of illy-ventilated apartments. The greatest mortality was in March—146; strangely enough April ranking next—136; the spring showing the greatest number of deaths from consumption—394, winter next—333, summer—295, autumn—285. Conclusions cannot be drawn from one year, but nearly the same ratio prevails in 1878, and markedly in spring. The greatest number by far die

* Fox: Air, Water, and Food.

between 20 and 30, although deaths are reported at all ages, and the old-fashioned variety that does not shorten life now and then is reported, chiefly from the smaller towns.

ZYMOTIC DISEASES.

The decrease in mortality from these forms of disease is very marked. In 1877 they are credited with 26 per cent. of the total mortality, in '78 23 per cent., in '79 19 per cent. This is due, doubtless, to improved sanitary conditions in many instances, and a better observance of hygienic laws. Diphtheria prevails more extensively in the country than in the cities, unless some epidemic occurs to swell the mortality. The occurrence of isolated cases in remote, thinly-settled districts, with little if any travel, furnish strong presumptive evidence of its origin *de novo* from filth. Of the principal varieties typhoid fever is credited with 159 deaths only; the average for the last ten years, 370. Diphtheria, 256, while over 500 is the average for three preceding years. Croup, scarlet fever, and cholera-infantum are about the same as the average for the last ten years..

MALARIAL FEVERS

have increased steadily. In 1877, 45 deaths; 1878, 145; in 1879, 198. The congestive type is also well marked, and in some instances fatal in less than twenty-four hours. Unconsciousness and coma rapidly supervene. Enlarged spleens are met with more frequently, malarial broncho-pneumonia, enteritis, and cystitis, are reported, while various forms of anæmia, and especially of infantile debility are ascribed more or less accurately to malarial influences. One hundred and seventeen fatal cases of typho-malarial fever are reported. There is some doubt expressed with regard to the diagnosis of these cases—whether they are not really purely typhoid. This may be true in some cases, but there are without the least doubt a large number of mixed cases so closely related and uniform in symptoms as to deserve the name typho-malarial, and as can readily be seen, these cases are increasing. Cerebro-spinal meningitis, now endemic, is about as frequent as in 1878, occurring more especially in malarial districts.

HEART DISEASES

show the average mortality—440 deaths, rather more males than females. The large percentages from heart disease in some of the smaller towns is a remarkable feature,—usually where there are large areas of meadow land, slow streams, or ditches, and ponded water, as in Durham, 4 deaths in a total of 17, nearly 25 per cent.; New Hartford, 16 per cent.; Salem nearly 30 per cent.,—six out of 21. Those reported under five are generally congenital, but we do not find these in such towns as are referred to above. In a few cases rheumatic pericarditis was reported between 5 and 10 years. The greater number of acute cases from articular rheumatism occurring between 10 or 15 and 30. The largest mortality is found between 50 and 70; in 1879, 198 out of 440—nearly half.

INFANTILE DEBILITY

holds its usual rank, rather increasing if anything. The total number of infantile deaths also gives as usual about 30 per cent., the larger proportion in cities or towns, not enough difference, however, to indicate any great holocaust in the cities, nor as good a showing in favor of country life as might be imagined. Indeed, the few hot months of summer excepted, the average conditions favorable to infantile life are better in the city than in the country.

OLD AGE.

The comparatively large number dying of old age in 1879 is marked. Indeed, the mortality from 60 upwards is nearly a hundred greater than the infantile mortality, in 1878—over 300 less; and the deaths from 60 to 70—1,048—are greater than in any other decade, and is only exceeded by those under one, which is always largely in excess of all others. From 80 to 90 there were 661 deaths reported; 90 to 100, 145; and over 100, 13. The exact ages of those over one hundred is, perhaps, often somewhat problematical; there seems to be no doubt, however, in these cases that the persons were over one hundred at any rate, although the public records do not extend back further than 1848, so the ages could not be thus proven. The complaints of neglect of duty in officials because a birth occurring in 1812 was not registered were therefore hardly reasonable, even if a pension claim thereby fell through.

Nearly all the relations of vital statistics are comprehended

fully in the tables and summaries. The death rates have already been considered in their relation to birth rates. In studying them it must be borne in mind that in several cases they vary from a true ratio from changes that have been made in the boundary lines of the towns. The certified returns of population moreover had not been published in all cases when this report went to press, hence several errors may have arisen. In others the endeavor to secure a complete return raises the death rate of a town unduly above that assigned neighboring towns whose records are not so complete, as in East Hartford, where the records were completed by the faithful efforts of the registrar.

There are necessarily a few errors in so many combinations of figures; they are few, even the typographical errors that easily creep into a work of this kind, thanks to the careful superintendence of the chief of the proof-room. The tables have also been for the most part carefully overlooked by an expert, and it is hoped will be found satisfactory. They contain now all the information that the town registrars give, and several new features will be found which will be of increasing value as years pass. Indeed, this registration report preserves an epitome of the history of the people in many aspects. Much more is conveyed than the mere face of the figures and the sum total of the columns, and that too of a nature that cannot be found elsewhere. Each citizen figures here twice at least, when he enters life and leaves it, while the third great epoch in life finds here its record for the percentage that attain it.

LAWS

CONCERNING THE

Registration of Births, Marriages,

AND DEATHS.

REGISTRATION LAWS.*

It shall be the duty of the State Board of Health to have the general supervision of the State system of registration of births, marriages, and deaths. Said board shall prepare the necessary methods and forms for obtaining and preserving such records, and to insure the faithful registration of the same in the several counties, and in the central bureau of vital statistics at the capital of the State. The said Board of Health shall recommend such forms and amendments of law as shall be deemed to be necessary for the thorough organization and efficiency of the registration of vital statistics throughout the State. The secretary of said Board of Health shall be the superintendent of registration of vital statistics. As supervised by the said board, the clerical duties and safe keeping of the bureau of vital statistics thus created shall be provided for by the Comptroller of the State, who shall also provide and furnish such apartments and stationery as said board shall require in the discharge of its duties. That the said board, on or before the first day of December in each year, shall make a report in writing to the Governor, upon the vital statistics and the sanitary condition and prospects of the State.†

SECTION 1. Every registrar of births, marriages, and deaths shall hold office for one year from the first Monday in January next succeeding his appointment, and until his successor is appointed and qualified.

SEC. 2. The registrar shall ascertain, as accurately as he can, all the births, marriages, and deaths occurring in his town, and record the same in a book or books kept by him for that purpose, in such form and with such particulars as shall be prescribed by law. He shall give licenses to marry, according to the provisions of law, and shall make and perfect all records of the birth of any child born in his town. He shall record in the books furnished by the Bureau of vital statistics such facts con-

* The following provisions are compiled from the unrepealed portions of the different statutes.

† January Session, 1878.

cerning the births, marriages, and deaths in his town as may be therein required; and he shall amend his records as he may discover omissions or mistakes therein; annually, on or before the twenty-fifth day of January, shall send the superintendent of vital statistics an attested abstract of said records for the year next preceding the first day of said January, which shall be made in such form as shall be prescribed by said superintendent, and shall deposit a true copy thereof with the town clerk.

Sec. 3. Every physician or midwife, who shall have professional charge of the mother at the birth of any child, and every attendant who may act as midwife at such a time, where no physician or midwife is employed, shall, during the first week of the month next succeeding such birth, furnish the registrar of the town wherein such birth may have taken place a certificate signed by such physician, midwife, or attendant, stating, from the best information which the signer of said certificate can obtain, the facts required by the Bureau of Vital Statistics.

AN ACT CONCERNING THE REGISTRATION OF BIRTHS, MARRIAGES, AND DEATHS.

Section 1. The registrar, for completing each record of birth by inserting the full name of the child, shall receive from the town ten cents, and for ascertaining, recording, and indexing each birth of which no certificate has been furnished, fifty cents.

Sec. 2. Every physician residing without the town wherein a birth or death occurred under his charge shall make return thereof to the registrar of such town, and he shall receive therefor from the registrar an order on the treasurer of such town for the fee prescribed by law.

Sec. 3. No deceased person shall be buried in any town having an incorporated city within its limits until a burial permit, stating the place of burial and that the certificate of death required by law has been returned and recorded, has been given by the registrar, who upon receipt of such certificate shall issue such permit; and upon application, when permits are required, the attending physician of the deceased, and the coroner in case of an inquest, shall give such certificate; or if there be no attending physician, or his certificate cannot be obtained early enough, or where immediate burial is required, any member of the local board of health, or any physician employed to have charge of the poor of said town or city, shall give such certificate to the best of his knowledge and belief, and the registrar shall record the place of any burial other than in a public cemetery, and for each permit shall receive twenty-five cents from the town.

Sec. 4. In all towns the secretary or committee of each cemetery association shall report to the registrar of the town in which such cemetery is situated the name of the sexton at present in charge of such cemetery, and of any change hereafter.

SEC. 5. Every person having charge of any burial-place shall during the first week of every month return a list, for which he shall receive fifty cents, of all the interments, disinterments, and removals made by him during the next preceding month, with the date thereof to the registrar of the town, who shall record the same in a book to be furnished by the bureau of vital statistics.

SEC. 6. Every person violating any of the provisions of this act shall be punished by a fine not exceeding twenty-five dollars.

SEC. 7. All acts and parts of acts inconsistent herewith are hereby repealed.

Approved, March 28, 1879.

AN ACT RELATING TO RETURNS OF DIVORCES.

SECTION 1. The returns of divorces required of clerks of the superior court to the State librarian, by section three, part sixteen, chapter one, title three of the general statutes, shall hereafter be made to the secretary of the State board of health, which returns shall be tabulated and published in the annual report of said board.

SEC. 2. This act shall take effect from its passage.

Approved, March 28, 1879.

TOWN OR CITY BY-LAWS.

Any town or city may enact by-laws, not contrary to law, more effectually to obtain a perfect registration of births, marriages, and deaths; and the registrar of the town in which such by-laws may be enacted shall execute their provisions under the same oath and penalty as if they were the statute laws of the State.

FEES.

Registrars of births, marriages, and deaths shall receive for ascertaining and recording each birth, marriage, or death ten cents; for issuing a certificate of license for marriage, fifty cents; for making an abstract, two dollars; for each name on such abstract over two hundred, two cents.

No person shall open any grave for the disinterment of the body of any deceased person, in any public or private cemetery or burial-place, or disinter or remove such dead body from the town in which the death took place, without having procured from the registrar a permit therefor.—Feb. 28, 1877.

DISINTERMENTS.

On the receipt by the registrar of a certificate of death, properly made in the form furnished by the superintendent of vital statistics, the registrar shall issue a permit for the disinterment or removal of the body of any deceased person, stating therein the

locality of the interment, disinterment, or removal. No permit for the disinterment of the body of any deceased person during the months of June, July, August, or September shall be issued, except when required for the purposes of a legal investigation.

Every registrar of births, marriages, and deaths shall receive for issuing each permit as herein provided the sum of twenty-five cents.—Feb. 28, 1877.

RETURNS OF BIRTHS AND DEATHS.*

Duties of Persons who Shall Make Returns of Births and Deaths to the Registrars.

BIRTHS.

Physicians or midwives, or any person acting as midwife at the birth of a child, should make return of the same, upon the blanks furnished by the Registrar, within the first week of the month next succeeding such birth, signed by the person making the returns, stating the facts therein required from the best information which the signer can obtain. Each birth should be promptly reported, and the record of the name inserted afterwards. Parents should be instructed to report the name to the physician or registrar as soon as determined. A provision is made for a fee for the registrar on completion of an imperfect record.

DEATHS.

It is the duty of the attending physician to report on the blanks furnished by the registrar each death, with all the facts required by law. In cities, this certificate of death should be in the hands of the registrar before a burial permit is issued. There is no other way to secure complete returns of deaths in populous places than by the system of burial permits. The testimony is unanimous on this point. By reference to the bulletins of the National Health Board it will be seen that the cities which do not require a burial permit previous to interment are rapidly becoming exceptional. The attention of physicians is respectfully urged to the requirement for promptly filling out certificates of death. A little care on their part will save a great deal of unnecessary friction. If the cause of death be written in by the physician, and the certificate signed by him, the other facts can be readily filled out by the undertaker.

* The following suggestions concerning the provisions of the registration laws are given in reply to questions that have been submitted.

It is the duty of the physician to sign the certificate of death *forthwith.* The friends of the deceased should secure from the attending physician as soon as may be after death the certificate required by law, and furnish it to the registrar, who shall then issue the permit for burial. Proper respect for the dead demands at least that much attention be paid to their memory. The friends of the deceased are the proper persons to arrange this matter, to see that the facts concerning the last event in life about which the State concerns itself with relation to each citizen be correctly stated. The business and social elements involved also justify the utmost precision and care. Protection of life and prevention of crime are also involved in this transaction.

Where burial permits are not required, the physician should return the certificates of death each month to fulfill the requirements of the law. Negligence here is by far too common.

COMPENSATION.

The fee for returning the certificates of birth and death is twenty-five cents. The penalty for violation or non-compliance with the registration laws relating to returns of births and deaths, is not less than ten dollars, nor more than twenty-five dollars.

DUTIES OF PERSONS BEFORE WHOM MARRIAGES MAY BE SOLEMNIZED.

Authority and its Limitations.

All judges, justices of the peace, and ordained or licensed clergymen belonging to this State or any other State, so long as they continue in the work of the ministry, may join persons in marriage, and all marriages attempted to be celebrated by any other person shall be void; but all marriages which shall be solemnized according to the forms and usages of any religious denomination in this State shall be valid.

Marriage within a certain degree of consanguinity is by law declared void.

CERTIFICATE OF LICENSE FOR MARRIAGE REQUIRED PREVIOUSLY TO THE CEREMONY.

No clergyman or magistrate is authorized to solemnize a marriage until a certificate of license is first delivered to him, under penalty of a fine of not more than five hundred dollars, or impris

onment, one or both. The marriage license can be used only in the town where it was issued; if used in any other town, the officiating clergyman or magistrate is liable to a fine of not less than one hundred dollars, or imprisonment, one or both.

RECORD AND RETURN REQUIRED.

Every clergyman or magistrate is required by law to return to the registrar, within the first week of the month next ensuing, the license certificates, with the fact, time, and place of each marriage certified thereon for all marriages celebrated by him during the month preceding, under a penalty of ten dollars for each omission.

The certificates should be signed with name and official title.

LAWS CONCERNING MARRIAGE.

(General Statutes, Title XIV.)

Chap. I.

Sec. 1. What Kindred cannot Marry.
Sec. 2. Marriage License.
Sec. 3. Certificate of Marriage.
Sec. 4. Certificates *prima facie* evidence.
Sec. 5. Who may join persons in marrage.

Section 1. Marriage between certain relatives prohibited.

Sec. 2. No person shall be married until one of them shall inform the registrar of the town in which the marriage is to be celebrated, or in case of his inability the town clerk, of the name, age, color, occupation, birth-place, residence, and condition (whether single, widowed, or divorced) of each. Such registrar or town clerk shall thereupon issue his certificate that the parties therein named have complied with the provisions of this section, which certificate shall be a license to any person authorized to celebrate marriage to join in marriage within said town only the parties therein named; but no such certificate shall be issued if either of the parties is a minor under the control of parent or guardian, until such parent or guardian shall give to the registrar or town clerk his written consent; and any registrar or town clerk who shall knowingly issue such certificate without such consent shall forfeit to the State one hundred dollars. Any person who shall join any persons in marriage without having received such certificate shall forfeit one hundred dollars.

Sec. 3. Every person who shall join any person in marriage shall certify upon the license certificate the fact, time, and place of such marriage, and return it to the registrar of the town where it was issued, upon or during the first week of the month next succeeding such marriage, and upon failure thereof shall forfeit ten dollars. The penalties for joining persons in marriage in violation of this and the preceding

section shall be paid to the town where the offense is committed, and the registrar shall sue therefor.

Sec. 4. The certificates required by the preceding sections of this chapter shall be *prima facie* evidence of the facts therein stated.

Sec. 5. All judges, justices of the peace, and ordained or licensed clergymen belonging to this State or any other State, as long as they continue in the work of the ministry, may join persons in marriage; and all marriages attempted to be celebrated by any other person shall be void; but all marriages and rites which shall be solemnized according to the forms and usages of any religious denomination in the State shall be valid.

Title 20. Chap. II.

Sec. 17. Every person who shall knowingly publish a false and fictitious notice of any birth, marriage, or death shall be fined not more than one hundred dollars, or imprisoned not more than six months.

Chap. VII.

Sec. 2. Penalty for bigamy: imprisonment in State Prison not more than five years.

Sec. 3. Every man and woman who shall marry within any of the degrees of kindred specified in the first section Chapter I, Title XIV. shall be imprisoned in the State Prison not less than two nor more than five years.

Sec. 21. Whoever undertakes to join persons in marriage, knowing that he is not authorized so to do, shall be fined not more than five hundred dollars, or imprisoned not more than one year, or both.

DUTIES OF REGISTRARS.

The registrar is the executive officer in each town for the registration laws, and it is his duty to see that they are complied with. It is his duty to make his record as complete as he can. Special provision is made by the act of 1879 for the completion of returns of births by securing the name of the child. The records of births are of little worth without the name.

In cities he is to issue burial-permits when required by law, and also permits for removal from one town to another. In case of disinterment or removal from one cemetery to another in the same town a permit is not required.

He shall record the facts required by law concerning births, marriages, and deaths in the record books furnished by the State, and should refuse to receive a certificate, glaringly defective, as a

satisfactory performance of the returns required by law. Where the required facts are manifestly unobtainable, of course a virtue must be made of necessity, and the incomplete returns accepted.

It is the duty of the registrar to issue marriage licenses on receiving a declaration of intention of marriage from one of the parties, and to record all marriages returned to him as solemnized in his town. In case of his inability the town clerk shall perform these duties.—*General Statutes, Title 3, Part V, Sec. 2.* The registrar is forbidden by law, under penalty of one hundred dollars, to issue a marriage license when either of the parties is a minor, under the control of a parent or guardian, unless such parent or guardian shall give to the registrar his written consent.

DUTIES OF SEXTONS.

Every person having in charge a burial place shall return to the registrar a monthly list of all interments, disinterments, and removals, in case there be any during the month. For such list he is entitled to a fee of fifty cents from the town.

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1792


DRAINAGE
PLAN OF THE CITY
OF
NEW LONDON
Surveyed and Drawn
under the direction of
W. H. Richards, Civil Engineer.
SCALE
FEET
264 feet = 1 inch
NOTE — Small figures show height above mean tide
— Contour Lines
— Covered Drains
— Un-covered "
— Boundry of Drainage Districts
— Pipe Sewers
HARBOR
SHAW'S COVE
WINTHROP'S COVE
ICE POND
POND
N. L. N. Rail Road
N.Y. & N.H. Rail Road
MEADOW
(Ice Pond in winter)
BROOK
CEMETERY ROAD
ASHCRAFT ROAD
ASHCRAFT LANE
CHAPPELL ST.
LEWIS LANE
VAUXHALL
WEST ST.
BROAD ST.
CENTER ST.
CLEVELAND ST.
CHANNING ST.
WILLIAMS ST.
FREMONT ST.
BRISTOL ST.
WALKER ST.
PLEASANT ST.
GRANITE ST.
AMITY ST.
RICHARDS ST.
BULKELEY PL.
HILL ST.
HEMPSTEAD ST.
SHAPLEY ST.
FEDERAL ST.
GIBSON ST.
MERCER ST.
BRAINARD ST.
HUNTINGTON ST.
CHURCH ST.
MERIDIAN ST.
UNION ST.
MAIN ST.
DOUGLASS
JOHN ST.
MASONIC ST.
STATE ST.
WATER ST.
ATLANTIC ST.
MANWARING ST.
FRANKLIN ST.
COTTAGE ST.
HIGH ST.
HOME ST.
JAY ST.
WASHINGTON ST.
METHODIST ST.
GREEN ST.
GOLDEN ST.
STARR ST.
PEARL ST.
BANK ST.
BLACKHALL ST.
AVENUE
HOPE ST.
PROSPECT ST.
COIT ST.
TRUMAN ST.
CANAL ST.
BREWER ST.
BLINMAN ST.
WEST COIT ST.
GRAND ST.
WOODBRIDGE ST.
HOWARD ST.
OLD FORT ROAD
CEDAR ST.
BAYONET ST.
NORTH MAIN ST.
MILL ST.
N.